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Standardization and Measurement Services in Guyana

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STANDARDIZATION AND MEASUREMENT SERVICES IN GUYANA

(A report of a National Bureau of Standards/Agency for International
Development Survey Conducted July 11-17, 1976)

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I INTRODUCTION

The U.S. National Bureau of Standards' three-man team visit to Guyana, funded by the U.S. Agency for International Development at the request of Dr. Dennis H. Irvine, Chairman of the National Science Research Council (NSRC) and Vice Chancellor of the University of Guyana, extended from Sunday, July 11 to Saturday, July 17, 1976, followed by one working day in Trinidad and Tobago by one team member, Kenneth S. Stephens. Effectively, five working days from Monday through Friday were available to the team for covering a wide range of activities in the Government of Guyana (GOG) organizations, GOG state owned and private sector industries.

The NBS team's specific objectives were:

- 1) to survey domestic and export oriented industries and related GOG and private sector organizations, and
- 2) to advise the NSRC on optimum means for establishing a National Bureau of Standards and related activities to assist effectively industrial development in Guyana.

Working to the tight tolerances of the time frame and the broad scope of the objectives, the team members have tried to generate some useful recommendations, fully realizing that their experience is so limited that the ultimate judgments and decisions must be made by Guyana's own leaders.

The reports on meetings and visits (Section III of this report) contain some suggestions, ideas, and recommendations that may be helpful as points of departure and guidelines along the way to effective standardization and quality control. The more important of these will be repeated and emphasized in the Summary of Recommendations (Section II) to follow and in Sections V, VI, and VII.

II SUMMARY OF RECOMMENDATIONS

1.0 General Recommendations

While Guyana is unique in its particular environment, geography, resources, population, government, and history, it is not unlike many countries seeking a national identity and development, including a significant establishment of science, technology, and industry. Guyana has already recognized a necessity to establish a program of standardization as a step on the road to successful industrialization. Other countries have taken this step and still others will.

While recommendations predicated on some of Guyana's unique characteristics will be made, based on the limited observations of the NBS team, the extensive thoughts and recommendations of representatives of countries already embarking on programs of standardization are also relevant to the case of Guyana. A significant collection of these recommendations is to be found in the Proceedings of a major ISO conference held in 1973 (reference 10 in section IX). Most are directly applicable to Guyana and represent alternatives for consideration as Guyana formulates its standardization program. The following are some of the principles and recommendations which have been selected from this reference by the NBS team for consideration by Guyana. They represent the consensus of experts on standardization programs from some 30 countries* and at least 6 international organizations.

- 1) In order to ensure an appropriate base for the activities of a National Standards Body (NSB) and to promote widespread understanding and support of its programs, all interested parties, including the academic profession, should be permitted and encouraged to participate in its standards-writing work.
- 2) The setting of priorities for the work of the NSB should be related to the over-all national objectives as specified in the national economic plan; although the UN and its specialized agencies and ISO can assist in defining needs, the final choice of priorities can only be made at the national level.
- 3) National standards bodies in developing countries should adopt an "integrated approach" to standardization (embracing standards writing, metrology, quality control, certification, and applied research) as providing the best means of ensuring implementation of standards and their adaptation to local conditions.
- 4) Developing countries must endeavour to balance the

* including one member of the NBS team (H. Steffen Peiser)

investment of their available resources in applied research and other activities for the improvement of quality, as well as in the writing of national standards. To achieve an appropriate balance, an integrated approach to standardization is essential.

- 5) Policies on the question of which standards should be compulsory and which voluntary vary from one country to another according to political and social structures. It is generally accepted, however, that many standards relating to safety, health, environment, and consumer protection usually administered by the NSB, following the ISO/IEC Code, need to be mandatory. In technological terms the main consideration is that standards, whether voluntary or compulsory, should contain an inducement for the improvement of quality; it is, therefore, important that standards should promote technological advance. Moreover, the precise legal status of standards is of less importance than the efforts of the NSB to promote implementation of standards, in particular through quality control programs.
- 6) A developing country should have a system of certification, usually administered by the NSB, following the ISO/IEC Code of principles for certification systems, which assists export promotion. ISO, IEC, and the UN should help these bodies in their efforts by providing technical advice and financial assistance.
- 7) In its certification activities the NSB will need to take account both of its own national standards and other international or national standards of other countries, according to the market requirements.
- 8) NSB's in developing countries should be fully aware of the work of the ISO Certification Committee (CERTICO).
- 9) Governments in developing countries should strengthen the role of the NSB's by implementing nationally approved standards in all their operations, particularly public purchases, and by using, whenever possible, the technique of "reference to standards" in legislation and regulations.
- 10) The national and regional standards bodies in developing countries should organize, with the assistance of ISO, information campaigns on standardization intended for all levels (government, university, schools, industry, general public, etc.)

- 11) In principle, the Central Secretariat of ISO will be in a position to assist the NSB in defining needs and specific projects and in locating possible sources of finance or technical assistance, both multilateral and bilateral. The NSB, however, must convince its own government of the importance of these projects in order to ensure their inclusion in over-all development programs submitted to multilateral and bilateral agencies.
- 12) The NSB's in developing countries should maintain an awareness of the work of international technical committees dealing with questions of major importance for their exports, and participate in this work as far as possible.

2.0 Specific Recommendations

A major step in solving a problem is defining the problem itself. For purpose of direction and focus the NBS team came to Guyana with some specific areas to investigate: engineering safety, product standards, and quality control in small scale manufactures, all in connection with the proposed launching of a Guyanese Bureau of Standards (GBS). The team soon concluded that a significant problem was not so much what GBS should do but how they should do it; how they should sort out priorities, establish objectives, attain them in the least possible time, and where they could get the necessary information to solve problems. Specific recommendations were developed to supplement those of part 1.0 above as follows:

- 1) The Director of the NSB should be appointed and several additional staff recruited with minimum delay. The long lead time between the formal initiation of such organizations and their effective operation is a matter of historical record. Delay should be minimized.
- 2) As outlined in section III, part 10.0, a commitment on the part of the national government in terms of budget, personnel, and adequate organizational infrastructure is necessary. Requirements in these areas for Guyana's current and future level of activity must be assessed and presented for approval and implementation. The first year budget seems inadequate to get the program started at a level commensurate with Guyana's industrial activity.
- 3) An inventory of local and export product testing and technical information needs, including product standards, specifications, testing, inspection, and certification information in connection

with the standardization program should be carried out by acceleration and expansion of the present effort.

- 4) A correlated inventory of GOG and private sector test and laboratory facilities as well as information centers which can meet some of the needs above should be compiled, again by acceleration and expansion of the present effort.
- 5) A similar inventory of the most accessible external sources of assistance and experts should be made and a policy established as to the nature and extent of assistance desired. Some are listed in section III, parts 10.0 and 17.2 and section VI, part 2.0. If interested, action should be taken to initiate requests for assistance.
- 6) Corresponding membership in ISO would be helpful. Membership of IEC would be of benefit for the development of hydroelectric power stations and the distribution systems. Membership in OIML at this time may be an unnecessary expense.
- 7) Some specialized training of GBS staff will be found to be essential and the industrial inventory will provide some experience. GBS should survey international, regional, and other national training opportunities, at first for short term workshops, conferences, and communication exchanges, later for longer term training possibilities.
- 8) With respect to the organizational infrastructure mentioned in 2) above, several significant decisions, policies, and actions are involved:
 - (a) Policies to be determined on the standardization program -
 - i. Is it to be integrated in the sense of the general recommendations in part 1.0 above?
 - ii. Will the voluntary or compulsory approach be taken, or a combination?
 - iii. Is the program to include a certification and quality marking scheme?
 - iv. Is the certification program to cover domestic as well as export products?
 - v. Should there be a separate export inspection program on a per lot or batch basis?

- vi. Will existing functions of health, forestry, agriculture, etc., be brought under the standardization program and, if so, how?
- (b) Promulgation of an appropriate national standards act and related certification regulations,
 - (c) Formulation of a standards council compatible with the policies of (a) and (b).
 - (d) Development of an organizational chart for the GBS and the associated time frame for implementation compatible with (a), (b), and (c). As mentioned in section III, part 5.0, the proposed GBS organization chart may need to be implemented sooner than the projected 10 years. The Inspectorate Division might be used in support of the Certification Division. Provision for a public relations program should be made including consumer affairs and information services. (See reference 12 of section IX and recommendation 10 in part 1.0 of this section)
 - (e) Determining where the GBS is to fit into the GOG organizational structure. In this regard, it appears to the NBS team that the hierarchical structure presently being developed for the GBS may place the organization at too low a level in the overall government organization to allow it to adequately carry out its functions. Other structures should be considered. Perhaps the Director of GBS should report directly to the Minister of Economic Development, at least administratively, with functional responsibility to and support from the Standards Council, which itself might in time be raised to a higher level in the hierarchy. Some countries have organized their standardization programs at the ministerial level, as outlined in reference 10 of section IX and elsewhere. Top level support for Singapore's program has been instrumental in its success. The team believes that Guyana is in a position to give the necessary support and organizational strength to its standardization and industrial development program.
 - (f) Within the policies and organizations outlined above, decisions and policies should be made on procedures for coordination of standardization activities of other ministries and perhaps bring them under the Standards Council. Further ideas on this are given in section VI and in section III, part 5.0 with related references in parts 6.2 with respect to the National Export Council, 8.0 on Ministry

of Agriculture, 9.0 on the Forest Department, 11.0 on the Ministry of Trade and Consumer Protection and 13.0 and 14.0 on the Ministry of Health. The Standards Council and the GBS will soon represent an important resource which should be available and constructively used by all ministries.

- 9) Numerous references are made in the report to the program of technical assistance to small food processors and associated workshops for owners and potential entrepreneurs (section III, parts 4.0, 5.0, 13.0 and 14.0.) There are also related general recommendations (numbers 4 and 5) in part 1.0 of this section. Extension and advisory services could be highly effective and efforts in this regard probably should be expanded and accelerated. Advice need not be limited to products for which standards have already been prepared—quality requirements can be defined separately; such a service will contribute to a better standard or superior ability to conform to the standard when it is prepared; an extension service can result in substantial savings in costs and materials, increase production and expand sales. Similar services to non-food products should be developed. Principal areas might be textile products and building construction materials in conjunction with Guyana's program to feed, clothe, and house its citizenry. The Small Industry Corporation might be staffed and equipped to discharge this service in the non-food sector. Quality control training for management and technical personnel should be organized and carried out to support this effort.
- 10) The report also examines the potential usefulness for standardization in Guyana of an ongoing testing program, the use of existing laboratories, and the establishment of a test laboratory for GBS. (section III, parts 5.0, 10.0 and 15.0) Existing facilities can be used, at least initially, and several ideas for incentives to laboratories to cooperate are listed in the report. Concurrent with the use of existing facilities should be the beginning of an additional test laboratory or further expansion of the existing ones to perform needed tests for which the capability does not exist. In planning for the testing program, GBS might establish a testing committee consisting of top-level representatives from some of the main testing laboratories (e.g. Analyst Department, University of Guyana, Guyana Pharmaceutical Co., Guyana Sugar Corp., etc.) to map out a program of tests and coordination of testing facilities. In such planning, certain laboratories perhaps should concentrate on testing in certain major fields, eliminating duplication of expensive testing apparatus, and raising to a high performance level the tests within these major fields. Coordination of deliberate overlapping of tests

for scheduling and control purposes can be planned. Coordination of calibration can also be planned. Cooperation with such a group may lead to favorable responses to proposals for equipment grants from the various external sources.

- 11) With reference to the importance of applied research, discussions with NSRC (section III, part 4.0) indicated the development of a National Research Institute of Applied Science and Technology. This is seen as a significant complement to the standardization program to help develop better standards and improved quality of products. Discussions brought out immediate needs in areas of material properties such as clays, timber, sugar cane, and sugar by-products, etc. This should be pursued actively and linked with the standardization program.
- 12) One of the top priorities for standards development is an up-to-date building code, (See section III, parts 5.0 and 7.0.) Liaison with the Center for Building Technology of the U.S. National Bureau of Standards is recommended.
- 13) Discussions with the Guyana Timber Export Board (section III, part 9.0) revealed an immediate need for a technical committee on timber products to actively pursue harmonization of standards and a system for their application.
- 14) Of special significance in the rationalization of functions, responsibilities, and coordination, is the matter of Weights and Measures, and Metrication, currently the responsibility of the Ministry of Trade and Consumer Protection. This activity should be coordinated with the Bureau of Standards and the Standards Council.
- 15) Launching of a national certification program and related quality marking system can be initiated by focusing on well established industries. It can be accelerated by options to allow certification to other than Guyanese national standards, e.g., international, regional, other foreign national, institutional, trade, industry, or company standards (see related discussion in section III, part 5.0 and recommendation 7 of part 1.0)

III MEETINGS AND VISITS

1.0 NBS Team Schedule

Para.

July 12, Monday	a.m.	3.0	1st meetings at the Georgetown Mission of the USAID and the U.S. Embassy
	p.m.	4.0	1st meetings with the National Science Research Council (NSRC)
July 13, Tuesday	a.m.	5.0	Meeting with the Bureau of Standards Council of NSRC
	p.m.	6.0	Meeting with 1) The Guyana Marketing Corporation and 2) The Small Industries Corporation
	late p.m. and evening	7.0	Housing Project Tour and Dinner with Dr. Rex Woo-Ming, Government Analyst
July 14, Wednesday	a.m.	8.0	Meeting with the Guyana Rice Board
	p.m.	9.0	Meeting with the Guyana Timber Export Board
	late p.m.	10.0	2nd Meeting with NSRC at the Secretariat
July 15, Thursday	a.m.	11.0	Meeting with the Guyana Sugar Corporation
	lunch	12.0	Lunch Meeting with Executive Secretary of NSRC, Especially on Metrication
	p.m.	13.0	Cottage Industry Visits
	p.m.	14.0	Visit to Government Analyst Laboratory
July 16, Friday	a.m.	15.0	Meeting with University of Guyana Faculty and Tour of Facilities
	p.m.	16.0	Visit to Guyana Food Processors Ltd. (shrimp)

- late p.m. & evening 17.1 Discussions with U.S. Embassy,
and AID Debriefings
- 17.2 United Nations Development Program/
United Nations Industrial Development
Organization (UNIDO)

July 19, Monday

- a.m. 18.1 U.S. Embassy, Trinidad and Tobago
- 18.2 UNDP, Trinidad and Tobago
- 18.3 UN Multi-Sector Regional Planning
Project for the Caribbean Community
(formerly CRIAT)
- 18.4 UN Economic Commission for Latin
America (ECLA) Office for the
Caribbean
- 18.5 Trinidad and Tobago Bureau of
Standards

2.0 General Background (Notes from Briefings) (See Also Sections IV and V)

Guyana aims to be a socialist state based on cooperatives with strong historic traditions to British mode of government and administration of law. The narrow coastal belt with the capital of Georgetown is densely inhabited by over 90% of the population of about 800,000 which is 45% East Indian and 35% African descent. To develop the tropical rain forest and the savannahs beyond remains largely a challenge for the future. Much needed education is vigorously pursued by the GOG; 80% of the population receive primary schooling; yet only about 2000 presently attend the University of Guyana. There are, however, intermediate level efforts through a GOG Technical Institute, the Kuru-Kuru Cooperative College, the Guyana School of Agriculture, the Institute of Animal Health Assistants, etc. Personal religious affiliations are strong but freedom of choice is effective; almost 60% are Christians, 33% are Hindu. The party in power is the People's National Congress (PNC) under Cde. L. F. S. Burnham; the principal opposition party (although until recently in boycott of Parliament) is the People's Progressive Party (PPP) under Dr. C. Jagan. The Constitution provides for individual freedoms, the Prime Minister, the Hon. L. F. S. Burnham, and cabinet are responsible to a 53 member elected National Assembly of which they are members. There is a head of state, a President - currently His Excellency Mr. Arthur Chung. Besides the Prime Minister and the Minister of Parliamentary Affairs; the following ministries exist:

- Public Service
- Home Affairs
- National Development and Agriculture
- Regional Development
- Works and Housing (Communications)
- Foreign Affairs and Justice
- Cooperatives and National Mobilization
- Energy and Nature Resources
- Finance
- Economic Development
- Labour
- Information and Culture
- Education and Social Development
- Health
- Trade and Consumer Protection

Clearly the demarcation between and responsibilities of these ministries is in delicate balance further complicated by an effective regional system (six regions) headed by five regional ministers and a strong attachment to CARICOM, a Caribbean Common Market, including Antigua, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent, and

Trinidad and Tobago. Guyana has a remarkably sound economy where private enterprise for common national goals is encouraged by the side of wide-spread governmental involvement. A national identity and consciousness is achieved, technical and managerial skills are in short supply. Good personal and racial harmony exist, but the public in Guyana is extolled to seek even better ones and to develop an unexcelled loyalty and patriotic devotion to the nation's development.

3.0 First Meetings at the Georgetown Mission of the USAID and the U.S. Embassy

After a weekend arrival (7/11/76) we were cordially received by:

- 1) The U.S. Agency for International Development's Mission Director, Mr. Arthur Mudge, the Program Officer, Mr. Peter Kolar, Mr. Gregg Smith, Capital Development, and Mr. Forest Payne.
- 2) The Chargé d'Affairs at the U.S. Embassy, Mr. Wade H. B. Matthews, who a short time later left the post, and his successor, Mr. John Blacken.
- 3) Mr. Bernard Gibbs, Senior Scientific Officer at the National Science Research Council.

Mr. Gibbs outlined our program for the week. Mr. Mudge and Mr. Kolar explained the opportunities for technical assistance and the favorable climate despite political differences. The history of USAID programs in agriculture and investments was described. Guyana, despite its position in the UN as a third-world socialist country, left opportunities for entrepreneurs and cautious investments from abroad. There were difficulties with Guyana's relations to the Organization of American States, but with a highly educated political elite, Guyana, as a member of the UN Security Council, played a greater role than expected by its size.

Regarding Guyana's trade relations with the U.S., Mr. Matthews confirmed that the U.S. was now the largest single trading partner of Guyana, a position which was first realized in 1974. In 1973, imports from the U.S. amounted to U.S. \$43.0 million, exports to the U.S., \$28.7 million; in 1974, these figures were 66.3 and 67.5 respectively. Overall, the Guyanese economy, based on prime mineral (bauxite, chiefly), agriculture (sugar cane, rice, copra, etc.), fisheries (shrimp, mainly), and lumber, seems rather sound. Per capita income is rising and relatively evenly distributed.

4.0 First Meetings with the National Science Research Council (NSRC)

Discussions were held on Monday afternoon, July 12, 1976, with our principal host, Dr. Dennis H. Irvine, Vice-Chancellor of the University of Guyana and Chairman of the National Science Research Council, in his office at the University. In attendance in addition to Dr. Irvine, were Miss Eileen Cox, Chairlady of the Bureau of Standards Council and an Executive Member of the Guyana Consumers' Association, Mr. Bernard Gibbs, and Mr. Raj Persaud, scientific officers with NSRC. NSRC was established in November of 1974 by Guyana Act No. 26, though it had operated in some form since 1971. A copy of the Act was obtained and is included in Appendix A. It has authority (under section 8 of the Act) to establish working committees which they have chosen to call "councils" also. Six such committees have been established to date with a seventh under consideration. The six are as follows:

1. Agricultural Research Council
2. Bureau of Standards Council
3. Forestry Research Council
4. Council for Research on Manatees (a large sea cow)
5. Medical Research Council
6. Council for Science and Industry.

Under consideration is a Socio-Economic Council. Organizationally, NSRC is under the Ministry of Economic Development. At the present time, the NSRC secretariat is in temporary quarters at 44 Pere Street, Kitty, Georgetown. Under development is a National Research Institute of Applied Science and Technology and a building to house the activities of NSRC including the Bureau of Standards. Some Canadian International Development Agency (CIDA) support is expected for the building and equipment.

Invitation of the team to study and advise on standards development in Guyana was explained. Miss Cox had been corresponding with the U.S. National Academy of Science which Dr. Irvine also visited. Through the initial visits and dialogue, as well as visits to Guyana by USAID staff, Dr. Irvine requested the assistance of USAID resulting in the team's visit coordinated by US/NBS.

Further discussions centered on additional activities to date of the NSRC to develop a standards bureau to plan and carry out the country's program of standards promulgation and implementation including associated efforts in product testing and quality control. Directorship at the bureau has been considered and offered to Dr. Rex Woo-Ming, currently the Government Analyst in the Ministry of Health.

Some efforts have been devoted to the study of small scale food processing companies, including tomato ketchup, jellies, and peanut butter. There is a need for the development of a small scale bottle sterilizing unit for bottling ketchup. Concern was expressed over the quality of raw materials involving drying and storage operations. Additionally, processing and facilities were thought inadequate for many reasons.

Included in the discussion was a reference to the Lomé Agreement in which the 9 countries of the EEC entered into an open trade agreement with some 46 developing countries. The agreement was signed in 1975 and came into effect in April 1976. It opens up some additional export possibilities for Guyana and helps to place additional importance on the necessity for quality of products and use of standards.

A folder of papers on standardization, certification, and quality control was left with Dr. Irvine.

From the offices of the Vice Chancellor at the University, the team proceeded to the NSRC Secretariat offices at 44 Pere Street, Kitty. Discussions held with Mr. Gibbs and Mr. Persaud in addition to Isaac Azeez, accountant for NSRC, dealt with additional reference materials for NSRC's use. The following items were given to NSRC by Steffen Peiser on behalf of NBS:

1. Measures for Progress - A History of NBS.
2. NBS Special Publication - 417, Directory of U.S. Standardization Activities.
3. NBS Special Publication 300, Precision Measurement and Calibration, Volume 2, Temperature (One of a twelve volume set).
4. NBS Monograph 148, the Role of Standards Reference Materials in Measurement Systems.
5. NBS Monograph 250, Calibration and Test Services of the National Bureau of Standards.
6. NBS Monograph 260, Catalog of NBS Standard Reference Materials.
7. NBS Annual Report, FY 1975.

5.0 Meeting with the Bureau of Standards Council of NSRC

Present at the meeting were:

Dr. Dennis H. Irvine	Chairman of the meeting
Dr. Rex Woo-Ming	Government Analyst
Dr. Leslie Chin	Factory Manager, Guyana Pharmaceutical Corporation Ltd.
Prof. Leslie Cummings	Dean, Faculty of Social Sciences, University of Guyana
Mr. Cecil Pancham	Guyana Manufacturers Assn.
Mr. Cecil Outridge	Consultative Assn. of Guyanese Industry (Employers Assn.)
Mr. R. Westmaas	Architect, Faculty of Technology, University of Guyana
Mr. Bernard Gibbs	NBS Team Liaison (NSRC)
Mr. Raj Persaud	NBS Team Liaison (NSRC)

Miss Eileen Cox, regular Chairlady of the Council, was not able to be present.

Dr. Irvine opened the meeting with another brief description of how his request had originated and eventuated in the NBS team visit. He then introduced Dr. Rex Woo-Ming, proposed Director of the new (1976) Bureau of Standards.

Dr. Woo-Ming explained that current activities include:

- 1) The drafting of a national standards act with interministerial consultation on inputs is in process. An organizational plan for the Bureau of Standards has been drawn up and is given at the end of this write-up. While it was prepared on a 10-year planning basis, such staffing will be necessary much sooner for implementation of a standardization program.
- 2) Workshops with Bureau staff, the Manufacturer's Association and industrial plants, e.g., the first was recently completed for agreement on acceptable specifications for tomato ketchup including joint plant visits and recommendations for in-plant testing and quality control. Notable improvements have been made in the final product.
- 3) Meetings with small food processors toward expanding existing cooperatives and establishing minimum standards through the co-ops.
- 4) A Food and Drugs Law has been issued under the Ministry

of Health (Laws of Guyana, Chap. 34.03, Food and Drugs Act, 1971) but complete enactment and enforcement await further progress in (2) foregoing, i.e., industrial education and in the issuance of food and drug regulations. A standard marks system is also being discussed along with related problems in standards, inspection, and testing.

- 5) An inventory of testing facilities is underway at the major resource locations in Georgetown.

Dr. Leslie Chin, Factory Manager and Chief Chemist at the state owned CARIB Drug processing plant, pointed out that the Bureau had also conducted a questionnaire poll of the larger industrial plants on the five major exports, i.e., sugar, (see paragraph 11.0 in this section) bauxite, rice, timber and shrimp (see paragraph 16.0 in this section) to inventory their quality controls and possibility of sharing technical information with smaller industries. Drs. Woo-Ming and Chin returned to the subject of co-ops as a source of distributing the cost of technical assistance and sharing technical information. Also, in the area of foods and drugs, Guyana belongs to the Codex Alimentarius and could propagate Codex information through the co-ops, when formed.

Dr. Stephens spoke briefly on compulsory versus voluntary consensus standards pointing out that there are different degrees of compulsion that can be applied to the implementation of standards, even of the voluntary or consensus type - such as preference to goods conforming to standards in government and industry purchases. Mr. Peiser interposed the desirability of voluntary cooperation achieved by providing useful technical information and other technical support to industry through the standards organization.

Dr. Chin referenced the typical major constraint of developing countries' lack of trained manpower. Mr. Peiser suggested a beginning for specialized staff training in the annual workshops conducted by NBS and, later, Dr. Woo-Ming expressed his strong interest in attending the next workshop. Dr. Chin added that Dr. B. N. Singh of UNIDO and the Indian Standards Institution had visited Guyana last year from his UNIDO post in Barbados and had conducted a seminar on quality control.

Dr. Chin posed the difficulty of using other laboratories for bureau testing in view of each lab having its own priorities, precluding prompt response to bureau needs. At a later meeting (see paragraph 10.0) he proposed that the financial incentive is a strong one and should be pursued further - - citing his own laboratory services in measuring SO₂ in shrimp.

Mr. Peiser's scheduled remarks began with outlining the early importance of self-reliance based on local staff understanding of national culture, politics, economies and social context. He pointed out that early, specific proof that standardization "pays" is very difficult, but historically, all successful industrial nations have used it as an essential tool. Historical approaches in the U.S., Switzerland, Russia, Japan, et al., have been many and varied from highly centralized to widely decentralized organizations so that many options are open to developing countries. The U.S. is moving toward better regional and international cooperation. Guyana might also decide to make the most of its CARICOM (Caribbean Common Market) membership. The bureau should also consider early membership in the International Organization for Standardization (ISO) as a corresponding member, at which level benefits far exceed cost considerations.

Whatever historical approach Guyana chooses to follow, Mr. Peiser stressed the necessity of the classical standards committees to achieve the commitment and support of government, manufacturers, universities, the news media, and most important, consumers. Important here is the inclusion of representation of all ministries in the government since all will eventually be involved. For example, a program was suggested asking given ministries to sign off on affected standards as opposed to having every ministry represented on the standards council and perhaps becoming too large and unwieldy for efficient action.

Discussion shifted to the possibility of an accredited laboratory system to distribute the cost of testing for standardization, the early development of a modest certification program, product approval options by foreign national, regional, institutional, trade or industry associations or even manufacturing plant standards, (all of these are employed in Singapore) and access to essential testing procedures from other nations' standards.

The question of a separate weights and measures activity, on record in many countries, was viewed favorably as long as a clear responsibility to the standards Council was established. The voluntary (U.S.) versus compulsory (Cuba) approach to metrification entered the discussion and a system of accredited laboratories was again suggested as the best voluntary approach.

Mr. Westmaas, Architect, University of Guyana, posed the problem of construction standards especially electrical wiring and Mr. Peiser pointed out some very recent technical developments in this area that might be worthy of consideration. Mr. Westmaas also reminded participants of a 1935 building code which could very well be the foundation for updating construction standards.

Guyana has a Weights and Measures Act administered by the Ministry of Trade and Consumer Protection. The Metrication Board is under the same ministry. Total metrication is currently scheduled for 1981-82.

Literature on standardization, product safety specifications, certification and quality control distributed to NSRC and Bureau of Standards Council personnel include the following in addition to those listed in paragraph 4.0 of this section:

1. NBS Special Publication 329, An Index of U.S. Voluntary Engineering Standards.
2. NBS Special Publication 352, World Index of Plastics Standards.
3. NBS Special Publication 375, An Index of State Specifications and Standards.
4. NBS Special Publication 438, Testing and Certification for Export Products in Industrializing Countries.
5. NBSIR 73-275, Report to AID on an NBS/AID Workshop in Standardization and Measurement Services in Industrializing Economies, Office of International Relations, NBS, held on May 4-18, 1973.
6. NBSIR 74-550, Report to AID on an NBS/AID Workshop in Standardization and Measurement Services in Industrializing Economies, held on May 11-24, 1974
7. NBSIR 73-423, Guidelines for the Use of Computer Technology in the Developing Countries by Ralph A. Simmons, Institute for Computer Science and Technology, NBS, December 1973, Interim Report.
8. NBSIR 75-785, The Review of Standardization and Measurement Services at the Ecuadorian Institute for Standards, Raul Estrada and H. Steffen Peiser, OIR, NBS, June 27-29, 1974.
9. NBS Report 10 881, A Report on a Survey in Ecuador on Standardization and Measurement Services in Support of Industrializing Goals, May 1-12, 1972.
10. NBSIR 73-185, Standardization and Measurement Services in Korea, A Report of Survey Conducted Jointly by NBS & AID, June 19-30, 1972.
11. NBSIR 73-172, Standardization and Measurement Services in Turkey, A Report of Survey Conducted Jointly by NBS & AID, October 14-28, 1972.
12. Consumer Product Safety Commission (CPSC) Fact Sheets.
13. CPSC - Handbook and Standard for Manufacturing Safer Consumer Products.
14. American National Standards (Approved & Proposed) Affecting or Relating to Consumer Products, Safety, Specifications, Performance, Test Methods, ANSI.
15. ANSI Consumer Council Publication 2, Guideline for Organizing a Product Safety Program.
16. The ABC's of International Standards, ANSI.
17. 205 American National Standards Adopted Under the Occupational Safety and Health Act, ANSI.

18. Products Liability of Members of Standards Writing Committees, ANSI.
19. The Voluntary Standards System on Trial by Roy Trowbridge, ANSI.
20. Standards and Certification in a Developing Country, by Rohn Hopper and Ken Stephens, BSI News, April 1973.
21. Study Tour Workshop on Quality Control and Certification Marking for Industrial Products, Singapore, May 20-24, 1974, Final Report, ID/WG. 180/11, Aug. 5, 1974, UNIDO.
22. Thailand's Certification and Quality Marks Programme by Ken Stephens, 1975 ASQC Annual Technical Conference Transactions, pp 345-356.
23. Final Report by Ken Stephens, UNIDO Post:THA-082-SD (SF/ID), Thai Industrial Standards Institute, 28 June, 1974, (less annexes)
24. Creating Effective National Programs in Developing Countries for Standardization, Certification, and Quality Control by William Hunter, Ken Stephens and Easaw Chaco, ITCC, Vol III No. 4, Association of Engineers and Architects in Israil, Tel Aviv. October, 1974.
25. A Seven Country Survey of Certification Licensing and Quality Marks Programs by Ken Stephens, Quality, EOQC Journal, Summer, 1975 and Employment Generation Through Stimulation of Small Industries, Georgia Institute of Technology.

DR. WOO-MING'S TENTATIVE
PROPOSED ORGANIZATION CHART, GUYANA BUREAU OF STANDARDS (10 YEAR PROJECTION)

Director (97)

- 1 - Standards Officer III (22)**
 - Food and Agricultural Products Divions (14)**
 - 2 - Standards Officers II**
 - 4 - Standards Officers I**
 - 8 - Scientific Assistants**
 - Drugs and Cosmetics Division (7)**
 - 1 - Standards Officer II**
 - 2 - Standards Officer I**
 - 4 - Scientific Assistants**
- 1 - Standards Officer III (12)**
 - Chemicals Division (7)**
 - 1 - Standards Officer II**
 - 2 - Standards Officers I**
 - 4 - Scientific Assistants**
 - Labeling and Specifications Division (4)**
 - 1 - Standards Officer II**
 - 1 - Standards Officer I**
 - 2 - Scientific Assistants**
- Consumers Affairs Division (2)**
 - 1 - Consumer Liaison Officer**
 - 1 - Typist/Clerk II**
- Inspectorate Division (10)**
 - 1 - Inspector III**
 - 3 Inspector II**
 - 6 Inspector I**

Secretary

Deputy Director (49)

Secretary - Typist

- 1 - Standards Officer III (22)**
 - Engineering Division (14)**
 - 2 - Standards officers II**
 - 4 - Standards officers I**
 - 8 - Scientific Assistants**
 - Building and Raw Material Division (7)**
 - 1 - Standards Officer II**
 - 2 - Standards officer I**
 - 4 - Scientific Assistants**
- 1 - Standards Officer III (12)**
 - Textile, Garments and Footwear Division (7)**
 - 1 - Standards Officer II**
 - 2 - Standards Officer I**
 - 4 - Scientific Assistants**
 - Metrology Division (4)**
 - 1 - Standards Officer II**
 - 1 - Standards Officer I**
 - 2 - Scientific Assistants**
- Executive Officer (13)**
 - Purchasing and Stores Division (1)**
 - 1 - Purchasing and Stores Officer**
 - Library and Information Services Division (2)**
 - 1 - Librarian**
 - 1 - Typist/Clerk I**
 - Accounts, Records, and General Services Division (9)**
 - 1 - Clerk III General**
 - 1 - Typist/Clerk II**
 - 2 - Typist/Clerk I**
 - 2 - Female Attendants**
 - 1 - Office Assistant**
 - 2 - Watchmen**

Numbers in parentheses are the number of staff members in the given section, with the grand total shown at the Director level.

6.0 Meeting with the Guyana Marketing Corporation and the Small Industries Corporation

The NBS Team, accompanied by Dr. Rex Woo-Ming, Mr. Bernard Gibbs, and Mr. Raj Persaud, visited with representatives of the Guyana Marketing Corporation and Small Industries Corporation at the offices of the latter.

6.1 Guyana Marketing Corporation (GMC)

The Guyana Marketing Corporation is a government owned and operated enterprise. Technical Officer, Mr. Tom Hicks, described the new slaughterhouse, refrigeration and smoking plant which has gone into production for curing ham and bacon and which, later, will manufacture sausages, salami and possibly frankfurters. Annual turnover is around G\$3 million. The Corporation has received technical assistance from the EEC, Canada, and the U.S.A. Installation of refrigeration equipment and smoke house was assisted by Griffith Laboratory of Scarborough, Canada, to EEC standards.

Responsibility for assessing grade is given to the GMC purchasers. Pigs are weighed and graded for the slaughterhouse. Lards are processed and sold in bulk drums. Hydrogenated whole fat is used for margarine production. At present, there are two large edible oil plants using coconut for raw material. Government plans call for construction of a solvent extraction plant for which soybeans will be imported, initially.

GMC also buys all fruits (especially oranges for an orange juice operation), vegetables, and fish at controlled prices. (This does not include rice, sugar, coconut, or shrimp which enjoy separate treatment due to their economic importance.) Lists of government approved and controlled prices and grades are prepared by GMC and the Ministry of Agriculture. Quality incentives are limited to the grading factor for better prices. Farmers use the system to their advantage. During periods of surplus, farmers sell to GMC at the fixed prices; during periods of shortage, they sell on the open market for higher prices. GMC is committed to buy everything offered to them, often at considerable losses, representing a subsidy. Farmers often sell as much as possible in the open market and in the evenings offer their unsold and sometimes partially deteriorated produce to GMC. For tomatoes, for example, there is sometimes as much as a 30% loss by spoilage. Many of the difficulties in spoilage arise in transportation to and from buying points and lack of adequate storage facilities. Some development is underway to provide cold storage for vegetables at the "Farm Plant". Sorting and grading is done at the Lombard Street plant for distribution and sale.

Jams and jellies and other products are produced by the Guyana Agricultural Products Corporation (GAPC) and are supplied by GMC.

Corn is supplied to feed mills and "AERO" silos are now being developed at the "Farm Plant" for corn storage. Corn meal and popcorn are to be developed.

On weights and measures for produce and related products, supervisors check weights using weight standards from the licensing branch of the Ministry of Trade and Consumer Protection.

6.2 Small Industries Corporation (SIC)

At the same meeting, the Small Industries Corporation outlined a vigorous program. Discussions were with Dudley Chase, General Manager of SIC, his Assistant, Aubrey Smith, and Industrial Engineer, Noel King. The NBS team was very favorably impressed with this leadership.

SIC advances capital on applications to innovative entrepreneurs, favoring the non-traditional areas and projects which promise import substitution and (to a lesser extent) export promotion. Imports into Guyana are continually studied and items amounting to G\$100,000 per year or more are considered as potential areas to promote indigenous enterprise. SIC evaluates applications to enter into business and assists in conducting feasibility studies recorded on standard forms, requiring a month, normally.

Available funding during the two years of existence through a grant by the Finance Ministry has been G\$2.5 million of which G\$2 million has been disbursed. Loans are limited to G\$160,000 with terms up to 10 years at 8% per annum. SIC can borrow from the Caribbean Development Bank at 7 3/4% per annum. Loans are limited to two thirds of the capital cost of any project - not including working capital.

To encourage business starts, risks are not shunned, so a 30% to 40% payment arrears has been experienced and perhaps 10% loan defaults. Building, equipment, etc., are accepted as collateral for loans. The majority of the loans have been for new enterprises.

SIC's general manager sits on the Council for Science and Industry under the NSRC. SIC also is a member of the Guyana State Corporation, the holding company that manages and supervises all government owned industries. SIC was designed initially to assist small industry but has become involved in entering into joint ventures itself, e.g., a textile factory with the Peoples Republic of China. SIC has also filled some of the void in industrial promotion and development. SIC works closely with the Ministry of Economic Development which handles industry generally. It also has interaction with the National Export

Council and may have to handle export promotion and perhaps applications for fiscal incentives under regional agreements with CARICOM. These expanded activities may call for a restructuring of the organization. A UNIDO project with SIC has been approved in the country program, calling for experts in industrial engineering and industrial economics.

Foreign minority participation is by no means discouraged in Guyana. Raw material based industries must be government controlled, e.g., development of Kaolin would permit at most a minority interest of foreign (outside CARICOM) investment. Non-resource based industries may have some government involvement. Under new conciliatory rules to be agreed with USAID, the Private Investment Fund (PIF), which by now has been growing through repayments, will be used afresh. Earlier difficulties with the PIF were expressed in terms of the level of counterpart funds being too high. Training loans should be separate, but manufacturing expansion or feasibility studies can be funded under PIF. Standardization projects could be considered directly by SIC.

A program of export inspection is not practiced as yet but is being considered by the National Export Council. Such a program may even apply to the major exports, e.g., moisture testing of bauxite which affects the price. Partial control of some items is already practiced as in the case of timber (see write-up of visit to the Guyana Timber Export Board, paragraph 9.0, section III).

Representatives of the Guyana Manufacturers' Association were not present at the meeting, so scheduled discussions on GMA activities were not held.

7.0 Housing Project Tour and Dinner with Dr. Rex Woo-Ming, Government Analyst

In the late afternoon, Dr. Rex Woo-Ming took us on a quick conducted tour of the city emphasizing historic and contemporary architecture influenced by the fact that much of the coastal strip is below sea level. Georgetown and its suburbs would not be habitable but for an extensive dyke system and a sea wall presently being rebuilt, a major civil engineering venture in a country that has to import its cement. (No limestone has been found by the Geological Survey of Guyana so that the only scheme we heard of to alleviate this problem is to build a cement plant using imported clinker. Limestone is also imported as an essential fertilizer). Houses in general are built on stilts but the ground level often is boarded in for additional living space. New developments, most with single detached family units, are planned by income level. There is much attractive building even at the low-cost end of the spectrum and there no longer are distressing shortages. In one community the future home owners provide the work force but individual units are not assigned until all are finished so that

uniform standards are obtained. Guyana badly needs a building code. Future interaction with the NBS Center for Building Technology would seem highly desirable. A major structural problem for example, is the use of heavy timber beams for the foundation on mudlike soil. No good joints are known so that very long non-standard lengths are required. For school buildings, for example, timber companies must screen their allocated territories for a diminishing resource presently limited by access for transportation rather than by total reserves. The strong preference for greenheart beams suggests inadequate measurement of expected lifetimes of treated beams of other species. Closely similar problems arise for local telegraph poles with a 7 year expected life compared with 20 years for treated Canadian pine poles.

Classical colonial Dutch architecture is represented in the beautiful Stabroek Market with clock tower. The British colonial development programs have left their mark in the harbor, industrial, stores, and residential reserves built by the "Booker empire".

The most expensive villas being built are beautiful homes. A Cultural Center has just been completed. It is architecturally pleasing outside and seems well furnished also inside with most impressive wood paneling in the main auditorium with a large stage and orchestra pit. The Prime Minister's official residence, in keeping with the characteristics of the incumbent, is modest with family quarters not much larger than those of the White House in Washington. A monument to a slave in revolt in a strip of parkland is artistically powerful but has displeased many local critics although the theme of slaves in revolt for liberty and self-determination is held as the highest ideal accomplished in this country's history.

Dr. Woo-Ming then joined the team for dinner at the Pegasus Hotel. Dialogue on problems involved in getting the Bureau of Standards off the ground was resumed including Dr. Woo-Ming's difficult decision to leave an active laboratory career for one that may consist principally of administration and paperwork. This discussion served to emphasize the importance of a strong government commitment and support for the standards program including adequate budget, staffing, physical facilities, and proper organizational structure to enable necessary actions and interactions with other branches of government, industry and commerce.

8.0 Meeting with the Guyana Rice Board

A visit was made to the Guyana Rice Board, 1-2 Water Street, Georgetown, on Wednesday morning, July 14, 1976, where discussions were held with Mr. Neville E. Sutherland, General Manager, Mr. Vivian Chin, Deputy Director of Research, and Mr. Brooks, Chief Grader. The NBS Team was accompanied by Mr. Bernard Gibbs and Mr. Raj Persaud of NSRC and Dr. Rex Woo-Ming of the Government Analyst Department.

Mr. Sutherland sketched the history of the Rice Board which is a merger of two former organizations. The first was the Rice Marketing Board established by statute in 1939. It was mainly concerned with the marketing of rice, not including paddy although it had power to set the price of paddy, and was the sole buyer and seller of rice since 1939. Varying quality and price of rice prior to 1939, with resultant complaints by overseas buyers, led to the formation of this Board which also served as a war measure. In 1948 the Rice Development Company was formed to use modern large scale methods in rice cultivation. Two large rice mills, with capacities of five long tons/hour were established through the Colonial Development Corporation. In 1969, the Government took over the Company and renamed it the Guyana Rice Corporation. Then in 1973, it was merged with the earlier Rice Marketing Board to form the Guyana Rice Board, handling research, cultivation, milling and marketing of rice.

Since 1939, standards for grading of rice have been set by the Ministry of Agriculture, Chief Agricultural Officer, in conjunction with the Rice Board. Implementation of these standards is a responsibility of the Rice Board. Some input is obtained from rice customers. A copy of the present grading standard is given in Appendix B. It lists important quality characteristics or factors for parboiled rice and three varieties of white rice.

Grading officers are located at eight buying centers situated so as to reduce maximum travel to about 15 miles for farmers. Some 200 private rice mills are registered. Quality incentives are created by different prices for various grades. However, it was pointed out that the millers do not buy the rice directly from the farmers, but are paid for the milling service. This system would seem to reduce the incentive to the miller for careful milling adjustments.

Samples are drawn from outside bags and others during loading. Sample dividers are used to obtain a composite subsample of approximately one half pound for inspection. Defective grains are removed from the test sample, weighed and a percentage weight computed for comparison with the grading standard. An appeal process permits sellers to challenge the grading within a 10 day limit. Samples are kept for about 3 months, however. Approximately 3-4% of sample results are appealed.

Perhaps 1-2% are granted. An appeal can result in confirming the grade or raising it, never lowering it.

Some discussions on automatic electronic grading was held. It would be extremely desirable, if developed. Contacts with several organizations have been made in this regard with no success to date. This includes the Beaumont, Texas Rice Center and Garener Laboratory of 5521 Landelien, Bethesda, Md.

Moisture content is not used in the grading process, but is measured for control of purchases and milling. Electronic moisture meters are used at the rice mills. Interest in printed readout was expressed. A Burrows Model 700 digital moisture computer specification sheet was shown as an example of moisture measurement equipment. Solar drying on concrete pads is practiced commonly.

Some 240,000 acres are devoted to rice, mostly along the seacoast. Yields vary widely from 11 to 13 bags (1 bag is 140 lbs.) per acre to around 26 bags per acre on the Guyana State Farm but individual yields up to 35 bags per acre have been recorded. Production has not been stable over the last three years. Exports are to all parts of the world. Trinidad is the largest market principally for parboiled rice of extra super and super grade. Jamaica is a large customer for packaged white rice. Packaging is in 2 lb. (906 g.) polyethylene bags at the Georgetown factory and rice mill. Some eight brand names were displayed in the Rice Board office for domestic and foreign markets. IRRI varieties are not popular in Guyana due to their taste and appearance being too short for the long slim appearance preference of Guyana's customers. The Guyana Rice Board has also found that IRRI varieties are not resistant to the local Guyanese blast disease. Guyana participates in IRRI's genetic evaluation unit (GEU). Rice farming in Guyana is generally mechanized with large tractors used for initial soil preparation and combines for reaping and harvesting. Some interest was shown for the power tiller and the axial flow thresher and dryer for small operations. Equipment and operators for cultivating, sowing, harvesting, and threshing are rented to peasant farmers at "prices below costs" based on a fixed fee per bag of rice. Later comment by NSRC staff indicated that many farmers use these facilities and spend their spare time raising second crops of vegetables and fruits. On the larger GOG estates, aircraft carry out direct seeding for all Guyanese rice strains, and apply fertilizer and pesticides. Rice Board representatives speak knowingly of rice strains, diseases, pests, fertilizers and international market preferences.

After a low year in 1973, the 1974 spring crop produced a record of 43,500 tons, surpassing the previous highest production of 37,000 tons in 1969. This was further increased to 61,000 tons in the first half of 1975. Value of exports, even in 1973, approximately U.S. \$11 million, was sustained by an increase in unit value of more than 40%, while quantities were down by 31% over those of 1972.

9.0 Meeting with the Guyana Timber Export Board

Participating in the meeting and discussions in addition to the NBS team were the following:

P. Blamy	Toolsie Persaud, Ltd.
G. S. Edmondson	Forestry Department
Cecil C. Hepburn	Guyana Timber Export Board
K. Hurram	Toolsie Persaud, Ltd.
David Persram	Forestry Department
George R. Prashad	Personnel Manager
R. Ramdulara	Guyana Thermo-Plastics Ltd.
R. Scata	Toolsie Persaud, Ltd.
L. J. P. Willems	Willems Timber & Trading Co. Ltd.

The Timber Board is under the Ministry of Energy and Natural Resources and was formed in late 1973. Board Manager, Cecil Hepburn, chaired the meeting which turned into an early and very candid exposition of Board problems vis a vis the Forest Department and the saw millers. Out of 12 mills, of which 7 are currently active, only one is Government of Guyana owned and operated.

The Board has many responsibilities:

- 1) negotiating contracts with foreign buyers or their agents and holding the mills responsible for meeting the terms and specifications of the contracts.
- 2) shipping, paperwork and transfer of payments to the millers.

Thus, the individual miller deals only with the Board which collects a fixed fee for its services. On the other hand, the GOG Forest Department is responsible for inspection, grading and certification of all export lumber for seasoning, species, and soundness, but not for dimensions, which are left entirely up to the miller. The Board, which has no direct role in the grading and certification, is responsible for settling all claims by foreign buyers against the saw millers, i.e., the Board has a responsibility without any grading authority whatever. The grading rules, prepared and published in a handbook by the Forest Department, are very precise; so much so that both the Board and the millers fear that they preclude expansion of export sales that could be made according to modified specifications. The rules include dimensional specifications which are used only by the miller and buyer except in the case of foreign claims where they become the Board's unenviable responsibility to adjudicate. Mr. Willems, owner of one of the largest local saw mills, explained that

the relatively new grading rules (1974) were to be enforced only after a trial period of one year for adjustments and changes to be made at the request of the Board and the millers. Nevertheless, the rules were made effective immediately after publication. Moreover, the present rules do not cover some defects that buyers have criticized in recent exports.

Obviously, Forest Department communications with both the Board and the saw millers have not been too effective, though the principal Forestry Department representative, Mr. David Persram, displayed a very cooperative attitude in dealing with these problems. The NBS Team, on participants' reaction to a suggested central standards authority (with mixed results), proposed that a neutral central competence or qualified technical committee could do much to arbitrate the differences. Mr. Peiser cited the example of the embattled U.S. Food and Drug Administration which finds frequent consultation with NBS useful in settling disputes. One could surmise that even this meeting with the NBS team was the kind of open forum that might lead to better agreement on options already open to the three groups represented, e.g., the wider use of modified grades and the "ungraded lumber" designation to customer acceptance and sign-off.

Guyana's export lumber is almost all in heavy, durable marine construction grades and species, e.g., greenheart. Unfortunately, there is no reforestation program and forest management is only beginning. There have been no inventories so no estimates of reserves can be made. Large orders of single species cannot be cut in a typical tropical forest of mixed and sometimes unidentified species. NBS Team members suggested that the existence of a strong, competent technical authority might, through its other national and international contact, channel help to accelerate a progressive forest assessment and management program. Also, admittedly, high saw mill costs could be mitigated for both export and local lumber grades and sizes if a more cohesive standardization program were mounted in a national Bureau of Standards. In fact, good standards help resolve disputes among producers, dealers and consumers.

In closing, participants discussed the very grave problem of transportation of logs (the millers cut and transport the logs to their own mills), especially in the hinterland. Some help may be forthcoming in the long term from Canada and the IBRD (World Bank) in the form of large loans to improve transportation facilities on a country-wide basis.

Another problem currently facing producers is the discontinuation of timber leases by the Government in favor of an allocated "block" system and requirements to cut different species in the block. This system appears to be motivated on forest management principles but is

reducing the efficiency of the producers, in some cases, to the point of futility.

It was apparent that a systems study taking into account the roles, responsibilities, and authorities, of the main components (Export Board, Forestry Department, Producers) could result in a set of procedures and prescribed infrastructure for a smooth and viable operation of the timber and forest national program.

10.0 2nd Meeting with NSRC at NSRC Secretariat

Present at the meeting were:

Dr. Pat Munroe	Secretary General, NSRC
Dr. Leslie Chin	Factory Manager, Guyana Pharmaceutical
Dr. Rex Woo-Ming	Government Analyst
Mr. Bernard Gibbs	Senior Scientific Officer, NSRC
Mr. Raj Persaud	Scientific Officer, NSRC

At the request of the NBS Team this meeting was crowded into Wednesday's schedule. For the first time, the team met Dr. Pat Munroe, Secretary General of NSRC, who had just returned from England. After being assured that the schedule of meetings and visits was well under way, he asked to be excused since he was still recovering from an accident for which he had been under treatment in the U.K.

Drs. Woo-Ming and Chin proposed a series of questions and problems:

- 1) The first year budget for the Bureau of Standards is so meager (G\$40,000/U.S. \$16,000) that use of staff and facilities in other laboratories would appear to be necessary.
- 2) What is to be done about the existing priorities for testing in these laboratories?
- 3) Will the Bureau be limited to paperwork alone? For how long?

The NBS team did not purport to answer all these questions, nor any one of them perfectly, but essential priorities include paperwork for:

- 1) Establishment of a standardization program and related activities, such as operation of a bureau of standards, coordination and operation of test and laboratory facilities, weights and measures licensing and control, calibration assistance and control, certification licensing and control, quality control promotion and assistance, export inspection, etc., in order to support a growing industrialization program, will

require a commitment on the part of the national government in terms of budget, personnel, and adequate organizational infrastructure. Requirements in these areas for Guyana's current and future level of activity must be assessed and presented for approval and implementation. The first year budget of U.S. \$16,000 in contrast to a GNP in excess of U.S. \$400 million is meager, indeed, and is seen as a token amount to support initial start up studies.

2) An inventory of local and export product testing and technical information needs, including product standards, specifications, testing, inspection and certification information, in connection with 1) above, should be carried through.

3) A correlated inventory of GOG and private sector test and laboratory facilities as well as information centers which could meet the needs of 2) above, should be compiled. Priorities for tests can be achieved by financial incentives, appeal to national patriotism, by introduction of organizational changes, and related methods.

4) A similar inventory would help of the most accessible external sources of assistance and experts: ISO, UNIDO, Caribbean Common Market Standards Council, and, directly or through the Council, the Jamaican Bureau of Standards and Scientific Research Council, the University of the West Indies and related activities in Trinidad and Tobago, and Barbados; the US/NBS, the BSI, EEC, the Asian Productivity Organization, other sources in the U.S., U.K., Brazil, Singapore, et al., may be helpful if such external assistance is desired.

Planning and paperwork, this may be, but it is challenging and productive toward the establishment of a competent Guyana Bureau of Standards and associated assistance to industrial improvement and growth. Participants were reminded of the many options toward standardization open to developing countries as set out in the first meeting with the Bureau of Standards Council on Tuesday morning. Moreover, the fact that Secretariats for both CARICOM and its Standards Council are in Georgetown should facilitate regional contacts. NSRC integral connections with the University of Guyana should be pressed to solicit priority help from the University laboratories. Dr. Chin, himself, proposed that the financial incentive to do testing can be a strong one. Additionally, work experience for the academic program at the University of Guyana test laboratories can be a significant incentive. Advanced student assistants can be utilized in many cases.

Traditional ties with U.K., trade with the U.S., and upcoming trade with EEC and other countries, previous frequent contacts with IRRI, the recent treaty with Brazil, and strong relations with the UN should all work in a positive direction in accomplishing these early but vitally important tasks.

Significant literature obtained at the meeting is as follows:

- 1) National Science Research Council Annual Report 1975. The section from this report pertaining to the Bureau of Standards Council is reproduced in Appendix C and reflects activities, plans, and objectives.
- 2) Quality control survey and questionnaire forms. An Objective-Oriented System of Standards and Quality Control. This is reproduced in its entirety in Appendix D.
- 3) Report on the Development and Enforcement of Standards in Guyana to NSRC, April 1975, by J.A. Campbell, Caribbean Food and Nutrition Institute, Jamaica.

11.0 Meeting with the Guyana Sugar Corporation

Cane sugar, until recently the largest export product from Guyana, has now yielded first rank to bauxite. Sugar remains a close second. Since May 1976, the industry is almost completely nationalized under the Guyana Sugar Corporation reporting to the Ministry of Agriculture. Evidence of the "Booker Empire" clearly remains. The British Booker Company Ltd. not only dominated the sugar trade but was integrated into, for instance, shipping, which it still operates, and retail stores now also nationalized into "Guyana Stores Ltd."

On July 15, we were received by Mr. Joshua M. Ragnauth, a chemist now in a key management position. The Corporation operates eleven Estates with individual production controls and factories producing raw sugar (around 365,000 long tons per annum and around 3 tons per acre). One estate factory also has a "plantation" white sugar product for specialized domestic uses simply produced by additional washing and filtering raw sugar. The Corporation takes 10% of the cane from peasant farms who are offered ploughing and harvesting services below competitive cost.

Guyana's consumption is high, 35,000 long tons per year or 80 lbs. per head per year compared with over 100 lbs. per head in the U.S. - one of the highest in the world. Exports go to (in order) the U.K., U.S., Russia, China, Venezuela, and many other countries. Most raw sugar is shipped in bulk. That portion that is bagged is in 250 lb. woven (some lined) polyethylene bags for the home market, and 112 lb. for export, because foreign stevedores refuse to handle 250 lb. bags (!). The Chinese insist on jute bags.

Individual staff members belong to the International Society for Sugar Cane Technology (ISSCT) that produces proceedings and other literature. The Corporation adheres to the International Commission for Uniform Methods of Sugar Analysis (ICUMSA) and the Sugar Association of the West Indies which still exists separately from the Group of Exporting Countries from Latin America and the Caribbean, a kind of sugar OPEC.

The Corporation had filled out and presented to us the questionnaire received last month from the National Standards Council on the System of Standards and Quality Control which is reproduced in full in Appendix E. The questionnaire with associated numbered questions is in Appendix D (referenced in part 10.0 of this section).

Some further points arose from discussions. The 20 ton capacity scale at the Georgetown harbor is the most accurate in the country. Twelve ton scales are installed at the estates. There is a Government Weights and Measures Office in the Licensing and Revenue Department of

the Ministry of Trade and Consumer Protection. A Mr. Bentham calibrates and adjusts scales, but most of the calibration and maintenance work is performed by the manufacturer (Avery, mostly, of the U.K.) who has a representative in Guyana and who arranges for periodic visits of a competent technician.

Complaints are few. Those from the local market (on dirt) are said to receive undue attention. The U.K. market is more tolerant, especially on color, than the U.S. which charges penalties or pays premiums for superior controls on moisture value, color, insoluble ash contents and total sucrose (by optical rotation). Some discrepancies in measurement between Guyana's New York agent and the importer in the U.S. need to be studied. However, it is recognized that substantial reduction in price due to the color test readings are on a fair basis. Mr. Ragnauth indicated that the presence of some other optical active compounds (sugars) did interfere with the sucrose analysis - a great opportunity for the NBS (Prosen's) calorimeter which, however, I did not mention.

When world prices were high it was beneficial to Guyana to lower quality and vice versa. In practice this was very difficult to regulate because of the huge modern shiploads.

Mr. Ragnauth thought the Corporation would welcome and cooperate with the proposed National Standards Council, especially in the following areas:

- (a) Development of standards for packaging, sizes, labeling, product quality, etc.
- (b) Making available resource, limited laboratory facilities, and expertise.

Mr. Ragnauth also thought the Corporation would welcome development work by the NSRC's Science and Industry Division which in its new research laboratories might well find more uses for bagasse, molasses, etc., and even develop new sucrose derivatives. Brown sugar had proved unsuitable for the soft drink industry. Barbados had a research program for separating the sugar cane from the pith. The rind gave the best fibers, the pith the best animal feed.

12.0 Lunch Meeting with Executive Secretary of NSRC Especially on Metrication

The team had lunch on Thursday by invitation of Dr. Pat Munroe of NSRC. Present were Dr. Munroe, Dr. Chin, Miss Eileen Cox, an Executive Member of the Guyana Consumers Association and Chairlady of the Standards Council, and Mr. Raj Persaud of the NSRC Technical Staff. Mr. Peiser was asked to present a brief overview of the U. S. Metrication Program.

Mr. Peiser summarized NBS efforts to obtain, analyze, and then channel information on metrication to government and private sector organizations in the U.S., especially through professional societies and industrial associations. The American Society for Engineering Education now offers a "Metrication Kit" to its members. Traditionally, in the U.S., solutions to such problems must rest on a voluntary basis. The terms of international trade have injected an element of compulsion into the process of metrication as seen by some manufacturers. The General public tends to welcome the arithmetical simplicity of the Metric system.

Dr. Munroe expressed his strong desire for external assistance in Guyana's metrication program since so little had been done to date.

13.0 Cottage Industry Visits

Accompanied by Dr. Rex Woo-Ming, Government Analyst, and Gloria Singh, Scientific Officer in the Microbiology Division of the Analyst Department, the NBS Team visited two cottage industries on Thursday afternoon, July 15, 1976.

13.1 Omai Manufacturing Company

The Omai Manufacturing Company is a small home type industry owned and operated by Wilfred and Evelyn De Rushe with 12 employees. They have had the business for just over three years. Their sole products are two brands of peanut butter. They started with the "Omai" (an Amerindian name for "gold") brand and introduced the "Lyn" brand with an additional salt flavor two years ago based on market requests. Distribution to markets is through two principal agents. Demand currently exceeds supply though they continue to operate with one shift, selling all they make with a capacity of 1,200 pounds per day. Packaging is in sizes of 8, 10, 12, and 16 ounce polyethylene and glass containers and 25 and 50 pound drums for companies using the peanut butter as a raw material for processing in other products.

A Spanish type peanut has been selected to achieve the desired flavor. The peanuts are imported from India but appear to be transhipped through England. They are received shelled in 140 pound bags which are stored in airconditioned space.

The process steps are: (1) Roasting in a rotating type oven with electric elements (unknown temperature) for approximately 2 hours and 40 minutes. Rotation is at around 28 rpm. Oven capacity is three bags or 420 pounds; (2) skinning, which appears to be accomplished via rubbing action by a canvas belt drawing the roasted peanuts from a hopper through a constricted opening with counter air current in what appears to be a homemade unit; (3) sorting and inspecting the deskinned peanuts on a flat stainless steel table about five feet square with four to six graders. The table top is perforated near the middle with small holes large enough to allow the bitter corn of the peanut to pass through by a manual rubbing action of a quantity of peanuts by back and forth movements over the surface of the table. After sufficient rubbing, a quantity of peanuts is drawn to the edges of the table and inspected to remove overly roasted and blemished peanuts; (4) rough grinding during which salt and sugar are added according to the brand type; (5) fine grinding or milling which results in the extrusion of the desired consistency of the peanut butter; (6) packaging with manual weighing on a bench scale (including labeling). For bulk packaging, extrusion from the milling is directly to the drum.

The Government Analyst Department has been conducting a survey of sanitary practices and purity of final product with emphasis on tomato ketchup and peanut butter. Hence, the inclusion of this factory in our visits. Microbiological analysis of samples from this factory has shown unsatisfactory results. Little or no sanitary measures are carried out short of a general instruction to employees to wash their hands and clean equipment at the end of each day. The occasion of the

visit afforded additional opportunity to discuss this matter with the owner. Dr. Woo-Ming also gave a brief explanation to a number of the employees on the importance of good sanitary practices on public health (including themselves). Ultimately, he stressed continued sales and employment depend on good practices. Some of the items discussed were (1) use of knee or elbow operated faucets; (2) single use towels in dispensers (a cloth towel is provided currently); (3) written instructions in poster form and reminders for employee cleanliness; (4) dismantling and cleaning of grinding and milling machines at frequent intervals (considered difficult, and hence, prolonged); (5) use of rubber or similar type gloves (previously rejected for slowing up the sorting process); (6) keeping containers and lids in boxes until direct use, otherwise keeping containers stacked upside down until use; (7) introduction of a pasteurizing process after milling, (where milling is known to raise the temperature, perhaps a slight additional elevation of temperature may achieve the desired result); (8) similar processing of the containers (polyethylene containers are from Barbados and used directly from the carton while glasses are from France and cleaned with an ordinary vacuum cleaner); (9) screening of wall openings in the factory; (10) possible better control of shelf life via package dating (only shipping cartons are dated at present).

The owners appeared to be receptive to suggestions and were interested in expanding their operation as soon as possible. They obviously appreciated the assistance from the Analyst Department.

13.2 Chef-Aid Enterprises, Lot 6, Ogle Front,
E. C. Demerara, Guyana

A very small home industry preparing and bottling tomato ketchup. The business is owned and operated by Abdul Majid Khan and his son-in-law, Lalchan Viramuthu. Lalchan had been an employee of another tomato ketchup company (one where test by the Analyst Department had resulted in a 1% tomato solids measurement against a requirement of 6%). Tomato puree is made from fresh tomatoes selected and bought on the local market. Sodium Benzoate is sprinkled on top as a preserving agent. They have calculated the amount as 6 ounces in 14 gallons to achieve a maximum of 0.1%. Ketchup is cooked; caramel flavoring, cloves, and other spices are added, and a rice starch filler is used. The mixture is boiled for 45 minutes and food coloring, diluted in water, is added about five minutes after removal of heat. Bottles imported from Barbados (12 and 30 ounce sizes) are washed and bleached in an area outside the house. The washing operation involves soaking in a 3% caustic soda, washing with a brush, rinsing in chlorine bleach solution and rinsing in hot water. Bottles are moved to a bench inside the home. The bottles are manually filled with the hot ketchup using a plastic funnel and dipper from a plastic pan into which the

hot ketchup has been poured. Filled bottles are passed on for capping. Caps are from Canada. Capped bottles are turned upside down (to partially sterilize the cap) and set aside to cool. The Analyst Department has recommended accelerated cooling in water but this has not been introduced. They claim there is no problem with formation of a dark ring on the inside of the bottle at the filled edge.

Production is about 5 to 6 batches a day, 20 to 25 days per month. A batch is represented by 240 12-ounce or 96 30-ounce bottles. There was no production during the visit and apparently none for several days due to illness of the cook. There are five employees.

Lalchan handles contacts with wholesalers and supermarkets personally. They have received a certificate from the Government Analyst Department attesting to a 5.9% tomato solids content. This is shown on marketing contacts and has resulted in additional orders.

Besides some of the precautions taken in washing of bottles and the natural cooking of the ketchup, the process is almost void of sanitary measures. Cooking and filling are in unscreened and dusty rooms, frequented by flies. Many suggestions by the Analyst Department have been made and are under consideration. Both Mr. Khan and Mr. Viramuthu were cooperative and appreciative of help received. The business is only one month old and plans are being made to develop a separate factory location.

13.3 Some General Observations

The processing and packing of highly perishable food at the cottage industry level is a multi-faceted problem anywhere in the world. Guyana is no exception. With minimal equipment and maximal food handling, desirable sterility in both these cottage operations is almost impossible to attain. Both processors had obviously tried to implement suggestions made by the GOG Analyst lab staff. But neither processing area was screened, plastic package lids for peanut butter were hand sealed with plastic tape so that shelf life should be measured in days. (At present, distribution, on average, is estimated to require several weeks.) A small unit sterilizer for bottles might help the ketchup maker but environmental cleanliness, proper clean-up after shut-down, toilets and lavatories were sadly lacking in both operations.

Nevertheless, the GOG Analyst visits many of these cottage industries, provides specifications, e.g., percentage of solids and preservatives content, promotes accurate listing of all ingredients on container labels, presses for sanitary improvements and tests the final products for accurate content percentages, contamination, bacteria, and toxins.

This has resulted in notable improvements in many processed foods sold in the local market.

The size of this task is evident when one lists the variety of cottage industry products in the local markets: margarine, biscuits, jams, jellies, preserves, confectioneries, custard, curry powder, and other spices, beverages, butter, evaporated milk, etc.

14.0 Visit to Government Analyst Laboratory

Dr. Woo-Ming took the NBS team on a quick tour of the Department of the Government Analyst laboratory, which is under the Ministry of Health. In the older techniques, e.g., wet chemical analysis, there is here a residual and useful competence. Modern, instrumental analytical equipment is almost unavailable but electrical/electronic analytical apparatus from the 1940's and '50's in the U.S. were operating. Uncertain calibration methods and a history of poor maintenance may limit the accuracy of these instruments. A list of equipment in use at the Government Analyst Department is given at the end of this write-up.

Dr. Woo-Ming has worked diligently to repair laboratory apparatus. As indicated in earlier comment, he is active against harmful local food products, testing and inveighing against substandard tomato ketchup, soy souce, cassareep (cassava extract meat tenderizer), peanut butter, beverages (including alcoholic) jellies, jams, confectioneries, potable and industrial water. Routine microbiological tests using Caricom standards are carried out. Molds and yeasts are found frequently. His work also includes chemical investigations for the Police Department, some of which have been most successful. His staff of 24 is hardly adequate in terms of his national responsibility and the critical need to expand and improve the services. In this connection, some planning for the next five years has been started with the preparation of a proposed organizational chart for the Analyst Department which follows:

DR. WOO-MING'S TENTATIVE
PROPOSED FUNCTIONAL ORGANIZATION CHART - ANALYST DEPARTMENT
(UNDER MINISTRY OF HEALTH - - FIVE YEAR PLAN)

Government Analyst/Commissioner of Food and Drugs

Science Advisory Committee

Confidential Secretary

Government Analyst Laboratory

1 - Anal. Tech. Asst. II (to be created in 1977)

Deputy Government Analyst/Asst. Comm. of Food & Drugs

Principal Scientific Officer (to be created in 1976)

Physical Methods Division

1 - Anal. Sci. Officer (1 to be created in 1981)

Anal. Sci. Asst.

1 - Anal. Tech. Trainee (1 to be created in 1980)

Food and Nutrition Division

1 - Sr. Sci. Officer (1 to be created in 1976)

Nutrition Division

1 - Anal. Sci. Off.

1 - Anal. Tech. Asst. I (1 at present, add. post in 1977)

2 - Anal. Tech. Trainees (1 to be created in 1976, add. in 1977)

Food Division

2 - Anal. Sci. Officers. (1 at present, add in 1978)

1 - Anal. Tech. Asst. III (1 to be created in 1979)

1 - Anal. Tech. Asst. II

3 - Anal. Tech. Asst. I (1 at present, add 1976, add 1977)

4 - Anal. Tech. Trainees (1 at present, add 1976, 77 and 78)

Food, Drug and Water Microbiology Div.

1 - Sr. Sci. Officer (1 to be created in 1977)

Food and Drug and Water Microbiology Sections

2 - Anal. Sci. Off. (1 Food Mich. at present, add D & W Mich. in 1977)

1 - Anal. Tech. Asst. II (1 to be created in 1976)

2 - Anal. Tech. Asst. I (1 at present, add 1976)

3 - Anal. Tech. Trainees (1 to be created 1976, add 77 and 78)

Drugs, Cosmetics and Toxicology Divisions

1 - Sr. Sci. Off. (1 to be created 1976)

Toxicology Div.

1 - Anal. Sci. Off.

1 - Anal. Tech. Asst. II (1 to be created in 1977)

1 - Anal. Tech. Asst. I

1 - Anal. Tech. Trainee (1 to be created in 1976)

Drugs and Cosmetics Division

2 - Anal. Sci. Off. (1 at present, add in 1979)

1 - Anal. Tech. Asst. III

1 - Anal. Tech. Asst. II (1 to be created in 1979)

2 - Anal. Tech. Asst. I (1 at present, add in 1977)

2 - Anal. Tech. Trainees (1 to be created in 1977, add in 1978)

Consumers Affairs Division

1 - Anal. Tech. Asst II

Forensic Division

1 - Anal. Sci. Off.

1 - Anal. Tech. Asst. II

1 - Anal. Tech. Trainee (1 to be created in 1979)

Water Division

1 - Anal. Sci. Off.

1 - Anal. Tech. Asst. I

2 - Anal. Tech. Trainees (1 to be created in 1977, add in 1981)

Revenue and General Chem. Services Div.

1 - Anal. Sci. Off. (1 to be created in 1977)

1 - Anal. Tech. Asst. III

1 - Anal. Tech. Asst. I (1 to be created in 1978)

2 - Anal. Tech. Trainees (1 at present, add in 1979)

Executive Officer (1 to be created in 1977)

Purchasing and Stores Division

1 - Storekeeper III

1 - Storekeeper I (1 to be created in 1976)

Library and Information Services Division

Librarian I

Accounts, Records and General Services Division

1 - Clerk III General

1 - Clerk II General

1 - Typist/Clerk I (1 at present, add in 1977)

1 - Lab. Aide (Should be redesignated Male Attendant)

3 - Female Attendants

1 - Gardener (1 to be created in 1976)

2 - Watchmen

List of Equipment in use at the Government
Analyst Department

<u>DESCRIPTION</u>	<u>QUANTITY</u>
Vacuum pumps	4
Baird & Tatlock Microtome	1
Stanton Balance (200g)	2
Mettler Balance (160g)	1
Manesty - Tablet Disintegration Unit	1
Hanson Corporation Dissolution Unit	1
Griffin - Flask Shaker	1
Ovens	4
Furnaces	3
Gallenkamp - Ballistic Bomb Calorimeter	2
EEL - Flame Photometer	1
Christy & Norris Laboratory Mill	1
Mullard - Conductivity Bridge	2
pH Meter	3
Gerber - Milk Testing Apparatus	
(a) Gerber Centrifuge	1
(b) Gerber Shaker	1
Astell - Cryoscope Refrigerated	1
Bausch & Lomb - Spectronic 20 Colorimeter	1
Griffin - Thermostatic Water Bath	1
Bellingham & Stanley - Refractometer	1
Phillips - X-Ray Diffraction Apparatus	1
Pye Unicam - SP 500 U.V. Visible Spectrophotometer	1
M.S.E. Mistral 2L Refrigerated Centrifuge	1
BTL Analmatic - Karl Fisher Apparatus	1
Bellingham & Stanley - Polarimeter	1
pH Coleman - Electronic Photofluorometer Mod. 72	1
Hilger - Quartz Emission Spectrograph	1
Pye Unicam - 1800 Ultraviolet/Visible Spectrophotometer	1
Pye Unicam - GCV Chromatograph	1
Perkin Elmer 257 - Grating Infrared Spectrophotometer	1
Buchi - Rotovapor R	1
Baird & Tatlock - Autoclave	1
Virtis - Freeze Drying Apparatus	1
Leel - Incubator	2
Nephelometer - EEL	1
Carver - Laboratory Press	1
Manesty - Water Still	1
Omega Photographic Enlarger	1
Linhoff Camera	1

15.0 Meeting with University of Guyana Faculty and Tour of Facilities

At the Guyana University for a meeting with faculty members, we were first received by Mr. Errol Fraser, Acting Head of the Physics Department. He is a specialist in Optics and showed us with justified pride his teaching laboratory well designed to teach elementary classical optics. He also specializes in steam bending of tropical hardwoods on which the information in the literature tends to show that very little bending can be achieved. His experiments indicate that many of Guyana's thousand species can be bent successfully. He has heard little of the good novel work on impregnation which presently requires sophisticated pressure injection equipment at the felling site. Depending on viewpoint, he is realistic or pessimistic about time, staff, and facilities for other than teaching. He deplores uncontrolled private consulting because he claims it takes away from what rightfully belongs to the students. During the later meeting at which we stressed the benefit to students of exposure to real-world applied science problems, Mr. Fraser seemed to modify his position and we found his academic integrity impressive. This episode is recounted because it illustrates that in establishing new systems such as for standardization, it is essential to listen to diverse, sincere and valid viewpoints. We found it much easier to be listened to than would have been the case had we ourselves been faculty members of GU. When on the telephone, Dr. Pat Munroe later said he wanted NSRC to request an NBS consultant for one or two years. He was, I think, not concerned so much with technical knowledge as with the difficulty of achieving essential compromises which need technical understanding plus personal acceptance by one's peers.

When Mr. Bernard Gibbs joined us, he took the Chairman's role. The others are mentioned below in order of the incidental seating.

It is a little unfortunate that engineering faculty members had come and left because we were late. Busy people cannot be expected to wait. Punctuality for meetings is a reasonable requirement.

Dr. Rex Woo-Ming, Analyst, is the Director-designate of the Bureau of Standards who had been with us most of the week.

Ms. Edith Kunar of the Chemistry Department

Ms. Verian Thomas, Chemistry, is the part-author of a report on formulation of activities of the National Bureau of Standards (Guyana). She deplored the inaction following three years of debate.

Dr. Victor Bardouille, of the Chemistry Department

Dr. Mark Vahrman, Professor of Chemistry, has recently arrived and has an eye on applied science. He has three projects, one on the use of charcoal, another on wax from sugarcane, and a third on water purification.

Dr. Halvidar Singh is a teacher of experience who is interested also in glass-blowing. We later visited the little glass-blowing shop. A skilled technician could work to more profit with the addition of an annealing oven.

Mr. Krishnadat Brijpaul of the Mathematics Department is true to his descent, for he is a statistician, a subject in which Indians excel. His expertise would stand the National Standards Council in very good stead. He said a few faculty members have asked him to analyse data but none as yet have requested help before the measurements are made. Statistical help in experimental design is a prerequisite for good standards work.

Mr. Clifford Wong is also a mathematician. Both deplored the lack of a computer at GU while underused computers proliferated in Guyana. Complaints had been puring in to the University for failing to train enough programmers. We explained the responsibilities of the NBS Institute of Computer Sciences and Technology and its concern for good utilization of an important high-technology export from the U.S.A.

Ms. Marian Heyliger, microbiologist, has a function that is of extreme importance in Guyana. One must hope that she will teach many students, who can serve the developing food and processing sectors.

Dr. Girdhari, animal physiologist, deplored the fact that he had no previous knowledge of the Bureau of Standards Council or any plans for a Standards Bureau. He had some support from others who wanted to see more consultation and dissemination of policies and plans for science and technology.

The heart of the general discussion was on four principal subjects:

First, a description of the interaction between universities in the U.S. with technology, in general, and the standards system, in particular.

Secondly, Mr. Fraser emphatically described the ethical standards, independence, integrity, competence, and time of development that were needed for a successful standardization system. He felt such a standards program was attainable only through a major commitment by the Government.

Thirdly, we discussed the shortage of space and equipment, such as the absence of high vacuum and low temperature (below dry ice) facilities.

Lastly, the question was debated but not resolved whether a Guyana Bureau of Standards should have associated with it from the very start its own laboratory facility or whether it was practicable to draw on existing competences and facilities possibly under a system of laboratory accreditation for standards work. In the latter event, the University of Guyana and the new Institute of Applied Science and Technology would have to play a major role. Mr. Gibbs thought this was already agreed by the NSRC. As the need for entirely new tests and new test methodology development became apparent, the Standards Laboratory would take up these new directions. The question might be asked whether in a country like Guyana, desperately short of qualified specialists, there is any alternative to a call for great devotion and sacrifice on the part of the few who can help Guyana acquire the sorely needed diversified standards capability.

Our visit to the UG ended with a view of sample laboratories with much basic equipment in chemistry and engineering.

16.0 Visit to Guyana Food Processors Ltd. (Shrimp)

Mr. Deryck Siebs, Plant Manager, chaired the meeting. He tabulated some significant data for the NBS team visitor (Niels C. Beck) alone. This one plant exported, mostly to Japan and the U.S., 6 million lbs. of shrimp in 1975 at an average price of US \$3.00/lb. for gross sales of US \$18 million. Guyana Food Processors, GOG owned and operated, employs a fleet of 86 trawlers, most of which are U.S. or Japanese flag ships, and all of these have refrigerated holds with brine tanks where the catch benefits from immediate icing and, for some markets, treatment with sodium bisulfite to prevent "black spots". Seven trawlers at the dock flew American or Japanese flags and are so owned, but all ships are mostly Guyanese crewed and skippered. The only foreigner observed on docked ships was Japanese. According to Mr. Siebs, these foreign trawlers, who contract their catches to his plant, are only a small percentage of many foreign trawlers which fish the Atlantic within 200 miles of Guyana's shoreline, e.g., South Korea, Venezuela, Cuba and other U.S. and Japanese vessels.

According to Mr. Siebs, Guyana Food Processors is only the second largest shrimp processing plant in Guyana. An "American" processor has a larger plant (140 trawlers) two miles away. Another much smaller privately owned plant located in Georgetown, completes the processing picture. The equity position of the Americans in the "American" processing plant is not clear nor did the NBS team have an opportunity to pursue, at length, the subject of allowable foreign equities in Guyanese industries.

Quality of catch is a problem with the older trawlers relying on ice for holding shrimp on relatively long voyages. However, Mr. Gibbs said that 95% of the fleet is now refrigerated. Currently, only a visual check of shrimp grades is made with suspect samples being sent to Carib Drug (Guyana Pharmaceutical Co.) for chemical and bacteriological analysis (see reference in paragraph 5.0 of section III). The Japanese market has no objection to treatment with sodium bisulfite. The U.S. market does, and anticipating still more rigorous specifications being generated by the US-FDA, GFP has installed a "complete" testing laboratory and is recruiting staff for a more self-contained quality control, inspection, and testing system.

The new modern processing plant is completely equipped with U.S. machinery and controls. The frozen catch in bags is thawed, washed, graded, and deep-frozen in packaged solid blocks. Holding capacity is far in excess of present production. The processor deals directly with the buyer or his agent. Sanitation is excellent, human handling at a minimum, and employee facilities as good as the best in any Asian plant this team member has seen, including Japan.

Up-to-date Guyanese total exports or export shrimp figures are hard to come by but shrimp exports in 1973 were 12.6 million pounds. Like others, the industry was hard hit by OPEC's monumental increase in the cost of diesel fuel in 1973, but rising shrimp prices abroad and cancellation of a GOG export tax recovered a substantial net profit in 1975.

Recent declines in total catch have been blamed on both overfishing and shrimp "cycles" but both U.S. and Japanese research vessels have very recently confirmed, at least in part, the overfishing cause. This has prompted Guyanese authorities to consider the establishment of a 200 mile offshore limit, like Brazil recently declared and Ecuador has had for some years.

A short discussion followed with the only other participants: Mrs. Esselyn Paul, Guyana Agricultural Products Corporation, and Mr. Clement McCalman of NSRC explaining the decentralization of GOG testing facilities for crushed pineapple and dried fruit. The latter is packaged in plastic but the canning of crushed pineapple in small plants is a very ambitious program, in terms of both sanitation and cost.

Attention to the matter of quality control (including cost considerations) by Guyana Food Processors, Ltd., is reflected in the following outline of their instructions at major processing points bearing an April 3, 1976 date.

"NOTES ON QUALITY CONTROL OF PROCESSED SHRIMP FOR GLAZING OPERATION

1. DO NOT bring out more than 500 lbs. of shrimp at a time.
2. The flow of operation should be 500 lbs. being worked on and 500 lbs. being checked ready to be worked on.
3. This means therefore, that at no time there should be more than 1,000 lbs. of frozen shrimp waiting to be glazed.
4. When the shrimp has been taken from the contact freezer the door must be kept closed.
5. The temperature of the glazing water in the tank MUST NOT be higher than 35° F.
6. This temperature must be maintained by placing quantities of ice in the tank.
7. The sprays on the glazing line MUST always be properly adjusted to give a fine uniform spray, so that the water freezes on contact with the frozen shrimp.
8. Greater care MUST be taken when packings are placed in master cartons.
9. Greater care MUST be taken in marking and stitching and strapping master cartons.
10. Master cartons MUST NOT be thrown around and firm action MUST be taken against persons who persist in doing this.
11. Greater care MUST be taken when packing master cartons in the holding rooms.

"NOTES ON QUALITY CONTROL OF PROCESSED SHRIMP FOR PERSONS IN CHARGE OF HOLDING ROOM

1. A detailed study and greater efforts MUST be made with respect to packing in the room.
2. Cartons must not be packed in such a manner as to cause damage to the walls.

3. Master cartons MUST NOT be thrown around nor walked on, nor used as supports for conveyor belts.
4. Master cartons MUST be changed whenever they are discovered faulty and certainly before they are shipped.
5. When shipping ensure that cartons are properly marked and carefully handled by freezer-room crews or persons employed loading trucks.
6. Do not leave doors of holding room open for longer periods than are necessary when shipping.
7. When shipping try to avoid the careless handling of cartons and certainly not allow crews to walk over piles of cartons.

"NOTES ON QUALITY CONTROL OF PROCESSED SHRIMP FOR SUPERVISORS OF UNLOADING

1. DO NOT unload more shrimp than can be processed immediately.
2. Shrimp in bags left lying on the wharf causes temperature to rise and reduces the quality.
3. Shrimp MUST NOT be left in the wash tanks for longer periods than necessary.
4. Whenever shrimp is in wash tanks, ice MUST BE added to maintain a temperature of approximately 40°F to 45°F.
5. Shrimp MUST NOT be left in the wash tanks over the luncheon period.
6. Shrimp left in the wash tanks during the break period MUST have sufficient ice to maintain a temperature of 40°F to 45°F.
7. Persons engaged in stirring the bins MUST stir them thoroughly with a good washing motion but without causing damage to the shrimp.
8. Water in the wash tanks MUST be changed at regular periods.
9. When using both lines to process one boat, shrimp for the No. 2 line, must be thrown into the first wash tank and NOT in the second wash tank.

NOTE:

Because of the reduced use of sodium, it is imperative that the shrimp be kept as cool as possible during processing.

"NOTES ON QUALITY CONTROL OF PROCESSED SHRIMP FOR CHARGEHANDS OF
CARRYING-IN CREWS

1. Do not leave processed shrimp lying around the processing area.
2. Remove full pans and put empty pans in a constant stream operation.
3. Check freezer before loading to see that the room is operational.
4. After loading close door and switch on blower. This procedure shall be adopted until the room is fully loaded.
5. After loading check the pans, inform the Plant Attendant, who will check the freezer before it is finally closed. When the freezer is finally closed, notify Plant Attendant who will be responsible for putting room into operation immediately.

NOTE:

The board on the door of the freezer MUST state the quantity of shrimp and the companies to whom it belongs.

"NOTES ON QUALITY CONTROL OF PROCESSED SHRIMP FOR SUPERVISORS AND CHARGEHANDS IN PACKING AREA

1. Efforts must be made immediately to improve the quality of grading by the machines.
2. Reports by persons carrying out counts MUST be used frequently to maintain proper adjustment to the machines.
3. Counts taken on the floor MUST be frequent and machines adjusted accordingly.
4. Increased efforts MUST be made at the separation of pink and white shrimp and the picking out of broken shrimp.
5. Boxes of shrimp, after they are packed and filled with water MUST be thoroughly shaken and then opened to see that the top layer is uniformly arranged.
6. Boxes of shrimp MUST be more clearly marked and stamped, dirty and smudged cartons must be rejected.
7. Box makers MUST take greater care in marking and stamping boxes. DO NOT sacrifice good clear marking for speed.
8. Shrimp loaded on pans MUST be taken into the freezers as quickly as possible and in a constant stream during the time of processing.
9. In order to do this, I suggest that as trolleys are completed they are taken into the freezers in a constant stream.
10. Greater efforts MUST be made to ensure that no shrimp is left in the machines or on the tables during the break period or at luncheon. If shrimp is left during the break period it MUST be thoroughly and heavily iced.

" GENERAL

These notes are intended to help all of us to do a better job and these further hints are therefore just some brief reminders:

- a) We are food handlers and packers. We handle a product which can suffer spoilage very easily. If therefore, we want to maintain good quality we must keep our shrimp very cold all the time. This point is very, very important - VERY COLD SHRIMP IS VERY GOOD SHRIMP.
- b) Because we handle an expensive perishable product, we must take great care to see that the quality is good, the grading is good and the packing is good.
- c) In order to do the best for the product, we all must be alert, have initiative, be interested in our work and be prepared to give more than a normal job.
- d) We ourselves must therefore be healthy, clean in our habits, wear clean clothes and keep the Plant and surroundings in a very clean condition.

Our Plant depends on the efforts of each and everyone of us to maintain the high reputation, high quality and good prices our shrimp receive in the Overseas markets.

- e) All supervisory staff must ensure that employees use the hand-dip and foot-baths at all times and thus avoid contamination of shrimp with foreign and harmful bodies."

17.0 Discussions with U.S. Embassy, USAID and United Nations Development Program (UNDP) and United Nations Industrial Development Organization (UNIDO)

17.1 U.S. Embassy and AID Debriefing

Mr. Wade H. B. Matthews, U.S. Chargé d'Affairs with his deputy and successor, Mr. John Blacken, received the NBS/AID Team for an extensive debriefing session. Similarly, Mr. Arthur Mudge, outgoing Director of the US AID Mission in Georgetown, spent several hours discussing with us problems and opportunities. In both sessions, some time was spent analysing the possibilities of assistance by the U.N. and the U.S. on a regional or national basis. Several gaps in our visits were acknowledged but a consensus on important conclusions was reached. We acknowledge gratefully the encouragement and support received from the U.S. Embassy and US AID Mission. All readily agreed with a profound empathy for the development goals of the country and its people.

17.2 UNDP (UNIDO) - Guyana

The United Nations Development Programme office in Georgetown serves Guyana and the Lesser Antilles. The UNDP resident representative is Josef Schutzenberger. Representatives of a number of the UN agencies are in residence. The post of UNIDO Field Adviser has been vacant for some two years but is expected to be filled by August or September 1976.

Possible multilateral assistance to Guyana in the formulation of a standardization program was pursued with Birgitta Nygren, Assistant to the UNIDO Field Adviser, who has been in residence since June 1974. The country programme for Guyana for the years 1977 thru 1981 has just been prepared. This is coordinated with UNDP through the Foreign Aid Unit of the Ministry of Economic Development (Winston King, Director). The programme for 1977 is considered full or completely subscribed and for 1978 almost completely subscribed. Unless major revision of the country programme is possible and pursued, the earliest inclusion of a UN project in standardization (certification, testing, metrology, etc.), similar to those sponsored in other countries, would be in 1979.

Interim assistance may be available through the Special Industrial Services (SIS) programme of UNIDO. This has limitations of one adviser for a maximum period of six months. Such an approach may be reasonable during the formulative stages of development of the standardization program in Guyana. The task of helping to write the project document for a larger scale UN project can be included in the activities of an interim adviser if so desired. The steps

involved in pursuing this type of assistance are: (1) prepare project data sheet including background, institutional framework, duties, and qualifications of adviser -- assistance in preparation available from the UNDP/UNIDO office, (2) submission to the Foreign Aid Unit of the Ministry of Economic Development for approval, (3) forwarding to the UNDP resident representative for approval and further UN coordination, (4) forwarding to UNIDO, Vienna, for approval and recruitment of adviser, (5) selection of adviser from among available candidates by representatives of the Government of Guyana. This process is likely to take 8 to 12 months from initiation of the proposal to the arrival of the adviser.

18.0 Visit to Associated Organizations of Trinidad and Tobago

In view of the regional connections involving standardization and related activities uncovered by the NBS team in Guyana, especially the newly organized Caribbean Common Market Standards Council, and the possibility of organizing a regional technical assistance program, from which Guyana might benefit, opportunity was taken of the return trip to visit with associated organizations of Trinidad and Tobago.

18.1 U.S. Embassy, Trinidad and Tobago, Port of Spain

Discussions were with Ms. Bonnie Lincoln, Commercial Attaché, and centered mostly around the feasibility of a regional approach to technical assistance on standardization and related activities. Consensus was favorable for such a regional program by AID, UNIDO or both, though a program among a limited number of countries in the region may be more readily organized and implemented -- a view shared by Dr. Lines, Director of T&T Bureau of Standards, in discussions later in the day. Trinidad and Tobago is presently a recipient of assistance on tax matters by the U.S. Internal Revenue Service under program of Technical Assistance Advisory Commission (TAAC).

Information was obtained on procurement of copies of the Lomé Agreement and the GATT Code on Standards, items referenced in discussions in Guyana. Visits during the day were summarized in a later discussion.

18.2 UNDP, Trinidad and Tobago

A courtesy call was paid to UNDP where discussions were with Mr. Dimas Pires, Deputy Resident Representative, having recently taken up this post. This office serves Trinidad and surrounding areas with other offices in Guyana and Jamaica. No regional activities specifically related to standardization have been conducted and none is under consideration at present.

18.3 UN Multi-Sector Regional Planning Project for the Caribbean Community

Originally organized under the UN Economic Commission for Latin America (ECLA) as the Caribbean Regional Integration Advisory Team (CRIAT), the present project title represents a change of name coincident with an organizational change from ECLA to UNDP directly. The team leader is Dr. Nasau Adams. F.A. Francis is fiscal and financial adviser. Both were out of the country and information was ably provided by research assistant, Mr. Winston Rennie.

The project has close coordination with the CARICOM secretariat in Georgetown, Guyana, and with the Caribbean Development Bank (CDB). Activities to date include (1) fiscal summaries of individual countries in the region, (2) livestock and food research, (3) technical assistance to CARICOM and (4) some background work for the Lomé Agreement. This organization should be treated as a resource in planning and implementing regional standardization activities.

18.4 UN Economic Commission for Latin America (ECLA), Office for the Caribbean

Mr. Louis L. Smith, Statistician and Agricultural Economist, was a congenial and helpful host for the visit. ECLA's main office is in Santiago, Chile. The Trinidad (Port of Spain) office (more of a sub-office) serves the Caribbean.

A significant recent development is the formation of the Caribbean Development Cooperative Committee (CDCC) at the 16th session of ECLA in Trinidad in May 1975. The first meeting of this organization was held in Havana, Cuba, in November 1975. It is made up exclusively of independent countries of the Caribbean including the Bahamas, Barbados, Guyana, Jamaica, Trinidad and Tobago, et al. A secretariat in the ECLA sub-office in Trinidad is now being staffed. Its work program includes all aspects of economic and social development (hence standardization and related activities). It is viewed as more comprehensive, geographically and functionally, than CARICOM which is alternatively viewed as the "English Speaking" block. A UN inter-agency meeting was organized in July 1976, in New York to determine how they will work in concert with CDCC. The second meeting of CDCC is scheduled for November 1976, in Santo Domingo, Dominican Republic. Regional standardization activities in the Caribbean will need to be coordinated with CDCC.

18.5 Trinidad and Tobago Bureau of Standards

Informative and cordial discussions were held with Dr. Michael G. Lines, Director of the Trinidad and Tobago Bureau of Standards. While a food and drug ordinance has been issued as early as 1960, the standards act of T&T is dated in 1972 and standards regulations bear a 1976 date, so the program is only recently underway. Some 60-70 standards are in various stages of completion. TTS-1 is a "Guide to the Drafting and Layout of T&T Standards". Some assistance in the startup of the standards work was provided by a UNIDO project with J. P. Mehrotra of the Indian Standards Institute as adviser from June 1974, to June 1975.

Standards prepared by T&T BS are of several types including "basic requirements for", "requirements for", and "specification for". An attractive and informative newsletter is published bi-monthly.

The Trinidad and Tobago Bureau of Standards is heavily involved in the regional standardization activities. In fact, on the day of the visit the Trinidad Guardian and the Express carried articles announcing the selection of Dr. George Sammy, Chairman of the Standards Council of Trinidad and Tobago, as the first Chairman of the Caribbean Common Market Standards Council at the Council's inaugural meeting on May 20 and 21, 1976, at the CARICOM Secretariat in Guyana. Regional work is already underway as evidenced by a first draft for discussion on Certification of Goods in Regional Trade prepared on behalf of the CARICOM Standards Council by Dr. Lines and Dr. Henry of the Jamaican Bureau of Standards. They are also reviewing the Committee for European Standards (CEN) and Andean Pact procedures.

Dr. Lines opinioned that purely regional standards were unlikely for the immediate future. Rather, emphasis will be on harmonizing of existing mandatory standards through discussion and consultation with approval and implementation by the CARICOM Council of Ministers. With respect to regional technical assistance, Dr. Lines suggested that it would be more feasible to formulate a limited regional project among several cooperating countries. Trinidad and Tobago would be glad to be a part of such a program.

Interest in legal metrology and programs of weights and measures was expressed. Membership in OIML was suggested for consideration. At present, the Bureau of Standards is awaiting official word from Cabinet on the forming of a Committee to make proposals for the Weights and Measures ordinance. Present responsibility is vested in the Ministry of Industry, Trade, and Commerce with some electronics and electrical activity at Caribbean Industrial Research Institute (CARIRI). Also coincident with the visit was an article entitled, "The Scales are Loaded", with subtitle, "You are being Robbed!", in

the current weekly issue of The Bomb of July 16, 1976. The article reports results of a survey showing infrequent checking of scales (23% never checked) and inaccuracies of from two to four ounces (in favor of the vendor) on a one-pound pre-tested weight. Currently under study by the T&T Bureau of Standards are the model laws on metrology of Canada, U.K., Jamaica, and India. During the visit a meeting was arranged with Mr. Bertrand Harnanan, Standards Officer, T&T Bureau of Standards. He has just completed a three month training course in standardization at the Indian Standards Institute, New Delhi, with some emphasis on weights and measures and will be called upon to help develop the program of Trinidad and Tobago.

Interest was shown by Dr. Lines and Standards Officer, Mr. Gene Hutchinson, in the Thai Industrial Standards Institute program and related papers, and, therefore, the following materials were later mailed to Dr. Lines:

Reference Literature for Dr. Michael G. Lines
Trinidad and Tobago Bureau of Standards

1. United States Membership in the International Organization of Legal Metrology (OIML), NBS LC 1059, May 1975.
2. OIML Pilot Secretariat 25: Developing Countries (corresponding to technical committees) and Reporting Secretariat, RS 1 - 5 (corresponding to working groups) from the general program of Secretariats.
3. Work Plan, Reporting Secretariat P.S. 25/RS 3.
4. Weights and Measures Directory, NBS, March 1976.
5. Model State Weights & Measures Law 1975, NBS, NCWM.
6. Model Weights & Measures Ordinance, 1975, NBS, NCWM.
7. Regional Seminar on a System of Standardization and Metrology for Latin America, NBSIR 76-988, June 1974 (Issued February 1976).
8. Testing and Certification for Export Products in Industrializing Countries, NBS Special Publication 438, Singapor Seminar, May 1975 (Issued February 1976).

9. Industrial Product Standards Act (Translation), Thailand, 1968.
10. Ministerial Regulations Nos. 1 - 4, issued under the Industrial Product Standards Act.
11. Ministerial Regulations Nos. 5 - 8, issued under the Industrial Product Standards Act.
12. Certification Marking Procedures, Thai Industrial Standards Institute.
13. Standards and Certification in a Developing Country, by Rohn Hopper & Ken Stephens, BSI News, April 1973.
14. A Seven-Country Survey of Certification and Quality Marks Programs, by Ken Stephens, Georgia Institute of Technology.
15. Standards - A New Frontier for Quality, Presentation at 19th Fall Technical Conference, ASQC - Chemical Division and ASA - Section on Physical and Engineering Sciences, Denver, Colo., October 30 - 31, 1975.

IV THE ECONOMY OF GUYANA (For U.S. Reader Orientation)

Plagued by historical high and low spots and severe problems in communications and transportation, especially in its vast hinterland, Guyana's economy is still best described by the term most frequently used by Guyanese, that is, "vibrant". There is a deep local conviction that Guyana's people are more than capable of making capital of her substantial resources, that industrialization is the key to success, and that a free wheeling, hard driving approach to industrialization is the only way to close the gap between the dream and its realization.

Again, NBS Team opinions suffer from short exposure but the impression obtained is that the balance of trade was positive as late as 1972 and only the surge toward increased production has created negative imbalances since then. If tooling up can result in some of the more recent export earnings quoted to the team in specific product areas, the imbalance should be only temporary, e.g., Guyana exported 12.5 million pounds of frozen shrimp in 1973; in 1975, one newly equipped plant accounted for 6 million pounds at U.S. \$18 million. Although the U.K. and U.S. have been her principal trading partners, knowledge of many other international market preferences and the ability of local producers to meet them is growing rapidly. Altogether, CARICOM countries import U.S. \$1 billion/yr. Guyana, with 16% of the people in CARICOM, imports only 7% (U.S. \$70 million/yr.)

Moreover, CARICOM is also "vibrant", growing like hybrid rice internally and thrusting out in innumerable market fronts abroad. The per capita income is rising and benefits are far better distributed than in most developing countries.

Incentives to selected industries include income tax exemptions from one to ten years, tax free imports of machinery and equipment, essential raw and building materials not produced in Guyana. Allowable foreign equities in local industries are not clear although foreign industrial and commercial interests are quite evident. Additional incentives for foreign investment would accelerate economic growth, especially in medium and large areas where industrial 'holes' exist, e.g., glass and glass products, paper, industrial chemicals, plastics, canned and powdered milk products, cans, plastic containers and seals, fertilizers, pharmaceuticals, pesticides, and a variety of assembly line products where local labor could be better utilized in medium to high value added by manufacturing operations. (No adequate sources of calcium carbonate for cement have been discovered.)

Sugar, rice, meat and other processed agricultural items, fishing, lumber, mining and quarrying make up 72% of all 'industry' but coming on rapidly are secondary products: animal feeds, ham, bacon, lard, and a rather wide variety of processed food products; beverages, including alcoholic, building materials, industrial gases, wood products, metal products (limited), small ship building, paints and garments.

Guyana's major problems are feeding, clothing, and housing her 800,000 population, shoring up the narrow coastal strip on which most of them live, and improving transportation and communications, especially in her rich hinterland where ambitious programs for development are vigorously pursued. Guyana also lacks a deep harbor. Population, per se, is no problem and employment appears to be relatively high although worker productivity has yet to be surveyed. Typically, most economic statistics need updating, interpolation and extrapolation. In sum, Guyana's economy is developing very well.

V. THE PEOPLE

(For U.S. Reader Orientation)

As was pointed out in the General Background of this report, (see section III, part 2.0) 80% of Guyana's people received primary schooling, but far fewer go on to intermediate or higher education. Regardless, there is an educated leadership, articulate, responsive, and dedicated to the nation's omnipresent theme, "one people, one destiny". The many GOG and private sector leaders that the team met were refreshingly candid and very much aware of their single destiny and the problems that lie in the way. A notable percentage has foreign degrees, especially in the U.K., the U.S., and the University of the West Indies a regional facility that is obviously growing in competence and influence.

In medium and large industry, traditional disciplines are evident, shored up and expanded by social ferment and a singularity of purpose. There is an industrial estate in Georgetown, burgeoning with new medium to small industrial plants, most of which are a cut above many developing countries' industries in management, buildings, layout, equipment, and controls. Even in the cottage industry area there is an admirable spirit of private enterprise.

The people problems that accompany this expanding economy are, as expected, many and difficult. Leaders are spread very thin, serving on numerous councils and commissions as well as struggling to satisfy the demands of their specific assignments, in the GOG, in associations and cooperatives, and in the private sector. Racial integration, in this country with substantial minorities rather than dominant majority, is remarkably successful, but the worldwide inequities of racial discrimination cannot be solved overnight, even in Guyana.

Guyana University strives to complete and staff the new Institute of Science and Technology, the intermediate technical and trade schools are recruiting increased enrollments, admittedly with very limited resources. GOG, through its various agencies and cooperatives, is expanding services and memberships into the sparsely populated hinterland and NSRC, the Consumers Association, co-ops, and various GOG boards and corporations press ahead with both industrial producer and consumer education.

VI THE ORGANIZATIONS AND FACILITIES

1.0 Government of Guyana

Other reports, e.g., J. A. Campbell, 1975, have detailed the extent or desirable GOG ministerial, or organizational relationships with the proposed Bureau of Standards. This report does not propose to repeat these unless they bear directly on the recommendations. Generally speaking, there are too many entities rather than too few, i.e., too much compartmentation and proliferation of titles and purposes for the human and physical resources available. So it is with governments everywhere.

Nevertheless, NSRC appears to have attainable goals and excellent leadership. Some doubt must exist as to the awareness at high government levels of the vital importance of NSRC's proposed Bureau of Standards to successful industrialization, improved balance of payments, and higher standards of living. To be sure, GOG has placed some top priorities on these objectives, but do top leaders see the successful establishment of the Bureau as the historical tool all successful industrial nations have used to get there?

The proof will show in the top level budgeting and support of the Bureau's organization and growth, especially in support that GOG decision makers must provide to give the Bureau access to information and facilities in other GOG laboratories and through external sources of assistance. This does not excuse NSRC or the GBS staff from making every reasonable effort to "sell" the program through reasonable progress toward GBS goals, but in the ultimate analysis, high GOG leadership must provide adequate budget and continuous support for the best available staff, for their advanced training and development, for access to internal and external resources necessary to compile the various inventories recommended by the NBS Team and, eventually, for buildings and equipment to mount a capable National Standards Laboratory to meet national needs. A viable infrastructure cutting across the various lines of authority and responsibility on standards related functions between and within Ministries will also require top level cooperation.

It would appear that the necessary access for GBS to Guyana University staff and laboratories could be quickly worked out in view of the close relationship of the two organizations under NSRC, but the GBS concept has been under discussion for over three years and decisions and action are now appropriate. Similar working relationships must also be set up with the Government Analyst Department under the Ministry of Health, the Agricultural Products Corporation, laboratories under the Ministry of Agriculture and other

GOC Boards and Corporations with trained technical staff, technical information sources and testing facilities, e.g., the Timber Export Board, Sugar Corporation, Rice Board, Guyana Marketing Corporation, and the Guyana Food Processors, Ltd. Several of the groups expressed a willingness to work with GBS when questioned by the NBS Team. The Guyana Electricity Corporation, the Guyana Telecommunications Corporation, and the Guyana Water Authority should also be inventoried for possible assistance.

GBS must also maintain close connections with the Ministry of Trade and Consumer Protection and with the Guyana Consumers Association. In the final analysis, a clear and current understanding of consumer product reaction and public awareness of and satisfaction with what is being done about it is the ultimate accomplishment of an effective GBS.

The NBS Team had no contacts with the Guyana Military, but if local resources are to be used to the full, national military establishments almost invariably have surplus technical staff, unclassified information, and surplus facilities useful in industrial testing.

2.0 Other Organizations

The International organizations of UNIDO and ISO have been prominent in NBS Team recommendations. The inventories listed should include these as well as U.S. NBS, BSI, EEC, CARICOM, CDCC (see section III, part 18.4), the Asian Productivity Organization, IRRI and the Philippines, OIML, COPANT, Codex Alimentarias, U.S., U.K., Brazil, Singapore, Jamaica, Barbados, Cuba, and other national sources for standardization information, experts and training.

CARICOM and its associated organizations are especially noteworthy. In this connection, the team had the opportunity to read two meeting reports: The Regional Harmonization of Standards, Kingston, Jamaica, Sept. 25 - 26, 1974 and the Inaugural Meeting of the Caribbean Common Market Standards Council (with attachments of previous meetings on regional standards from Nov. 1968 and Oct. 1975) at Georgetown, May 20 - 21, 1976. This Council will have one representative from each of the member states in CARICOM: Guyana, Barbados, Jamaica, Trinidad and Tobago, Belize, Dominica, Grenada, St. Lucia, St. Vincent, Montserrat, Antigua and St. Kitts-Nevis-Anguilla. Guyana is represented on the Council's executive committee by Dr. Rex Woo-Ming (who has, we understand, accepted major responsibilities in the field of drug and cosmetic standards) and the NSRC has observer status on the Caribbean Common Market Standards Council.

The ambitions of the Council as outlined in the latter report addresses almost every point of regional or international interest or responsibility previously discussed in the context of GBS:

1. The formulation and adoption of regional standards.
2. Assistance in the development of National Standards Bureaus.
3. The development of regional testing facilities.
4. Coordination of testing methods and quality evaluation.
5. Advice on problems involving standards of products in intraregional trade.
6. Determination of quality and advice on acceptability of extraregional products.
7. Cooperation with international standards organizations.
8. Assistance to member countries in the development and promotion of new products for extraregional exports.
9. Assistance with intraregional education of consumers and manufacturers in standardization.
10. Recommendation and promotion of the adoption of a Common Market set of reference metrological standards.

The high, useful potential of the CARICOM Standards Council and the presence of its first staff in Georgetown presents many opportunities for GBS to share in and help lead in its development.

The earlier report on Harmonization of Standards provides an insight into available regional and national sources of technical information, experts and testing facilities, e.g., the University of the West Indies (Dr. Woo-Ming won his Ph.D. here), the Jamaican Scientific Research Council and Jamaican Bureau of Standards, the Caribbean Food and Nutrition Institute, the Trinidad and Tobago, and Barbados Bureaus of Standards. Through GBS, Guyana will now be able to share in the communications among these organizations: technical information, draft standards and by formal invitation, in this meeting, in the testing facilities in Jamaica.

National pride and lack of a standards organization may have deterred such exchanges in the past but now the advantages should loom so large that GBS's regional activities should be quickly initiated and pursued through these organizations, without losing oversight and responsibilities for control activities within Guyana's boundaries.

It is one thing to make inventories; it is quite another to implement the courses of action which are indicated. Time, budget and a sufficient number of competent staff are of the essence. The attainment of GBS objectives is not a one-man job and the recruiting of additional staff to assist the GBS Director should begin now, if GBS stature at home and regional leadership is to grow and mature.

The NBS Team would be remiss not to emphasize a truism, i.e., the lag between inventory preparation and the establishment of the relations indicated will be significant, no matter how diligent the pursuit. Especially in the case of international and UN organizations, this lead time may be two to three years from initial contact to materialization of assistance. Moreover, UNDP (UNIDO) budgets are already short of funds through 1979, although an NBS Team contact in Georgetown revealed the possibility of a UNIDO expert's assistance for 6 months as early as 1978 (see write-up in Section III, part 17.2). And while international and regional activities and assistance may be very useful in various stages of development, ultimately the philosophy and implementation of standardization are the concern and responsibility of every sovereign state.

VII CONCLUSIONS

The leadership in Guyana is fully aware that standardization is an essential prerequisite for successful industrialization. One method of introducing standards, measurement, and related activities is through a strong National Standards Council backed by capable technical staff and test facilities, possibly centered on a National Bureau of Standards. The decision to use this approach has been made by Guyana but the level of effort and support to date has left effective implementation for future realization. Some impatience at the slow progress in the field of standardization was expressed by some informed technical personnel.

The NBS Team is very much aware of the fact that many, and perhaps most, of the data, observations, and opinions expressed in this report have been reported before. As the team discovered, however, the important information is fragmented and hard to find. It lacks collection in a central facility, collation, and coherent application to the problems at hand. This, as the report has tried to point out, is one of GBS's primary purposes.

The team is also cognizant of the fact that some of the recommendations concern projects which have already been started, especially by the NSRC staff, e.g., a questionnaire poll of key industries has been initiated, workshops have begun and GOG laboratory facilities are already doing industrial testing. But the order of magnitude of all this activity is far below what must be achieved for successful industrialization. The report and its recommendations have strived to frame these additional essential inputs in the establishment and growth of GBS.

The ready availability of accurate, understandable technical information, alone, has produced some remarkable results, especially in the hands of industrial plant personnel.

VIII APPENDICES

Five appendices have been referenced in the preceding parts of the report as follows:

- Appendix A. Guyana Act No. 26 of 1974, National Science Research Council Act.
(Referenced in Section III, Part 4.0)
- Appendix B. Guyana Rice Board, Notice, Rice Marketing Act (Chapter 72:01), Specifications for White and Parboiled Rice to be Purchased by the Guyana Rice Board.
(Referenced in Section III, Part 8.0)
- Appendix C. National Science Research Council, Annual Report, 1975, Bureau of Standards Council Section.
(Referenced in Section III, Part 10.0)
- Appendix D. Quality Control Survey and Questionnaire Forms, An Objective-Oriented System of Standards and Quality Control.
(Referenced in Section III, Parts 10.0 & 11.0)
- Appendix E. System of Standards and Quality Control Operational in the Sugar Industry
(Referenced in Section III, Part 11.0)

APPENDIX A

G U Y A N A

ACT No.26 of 1974

NATIONAL SCIENCE RESEARCH COUNCIL ACT

I assent.

A. CHUNG
President
19th August 1974.

ARRANGEMENT OF SECTIONS

SECTION

1. Short title and commencement.
2. Interpretation
3. Establishment and incorporation of the Council.
4. Functions of the Council.
5. Members of the Council.
6. Affixing of the seal of the Council.
7. Meetings of the Council and procedure.
8. Committees.
9. Power to delegate functions.
10. Power to appoint officers and other employees and agents.
11. Protection of members.
12. Remuneration of members.
13. Funds and resources of the Council.
14. Accounts and audit.
15. Report and accounts to be submitted to the Minister.
16. Discoveries and inventions.
17. Policy directions.
18. Exemption from taxes.
19. Offences.
20. Regulations.

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AN ACT to provide for the establishment and incorporation of the National Science Research Council and for purposes connected therewith.

A.D. 1974 Enacted by the Parliament of Guyana:-

Short
title
and commence-
ment.
Interpreta-
tion.

1. This Act may be cited as the National Science Research Council Act 1974, and shall come into force on such day as the Minister may appoint by order.

2. In this Act unless the context otherwise requires - "Chairman" means the Chairman of the Council and includes any person performing the functions of Chairman of the Council.

"Council" means the National Science Research Council established by section 3.

"invention" includes any new process or new technique, whether or not a patent could be granted in relation thereto.

"member" means a member of the Council and includes the Chairman.

"Minister" means the Minister assigned responsibility for economic planning and development.

"Secretary-General" means the Secretary-General of the Council appointed under section 10.

3. There is hereby established a body to be called the National Science Research Council which shall be a body corporate.

Establishment and incorporation of the Council.
Functions of the Council.

4.(1) It shall be the functions of the council -

- a) to assist in the formulation of, and to advise the Government on, a National Science Policy;
- b) to determine priorities for scientific and technological activities in Guyana; and
- c) to promote research and to ensure the application of the results of scientific and technological activities to the development of agriculture, industry and social welfare in Guyana.

- (2) In particular and without prejudice to the generality of the provisions of sub-section (1), it shall be the functions of Council -
- a) to advise the Government on the application of science and scientific research to problems of national importance;
 - b) to advise the Government on priorities in the national research programme;
 - c) to advise on the allocation of funds for scientific research and on the recruitment and use of research staff;
 - d) to advise upon, and encourage the training of, research personnel by the provision of scholarships, fellowships, bursaries and other forms of assistance;
 - e) to advise on the action to be taken to maintain an adequate supply of scientific and technical personnel having regard to the need of Guyana from time to time for such personnel;
 - f) to advise on suitable arrangements for planning, managing and co-ordinating scientific activities at various levels, including the establishment of Research Institutes;
 - g) to review generally and advise on the programmes and budgets of Research Institutes;
 - h) to collect and disseminate information relating to scientific and technical matters, and to publish reports and papers and hold conferences on scientific and technical matters;
 - i) to do such other things as may be necessary for the advancement of scientific and technological research in Guyana for the purposes of national development.
- (3) Subject to the provisions of this Act, the Council shall have power to do anything which in its opinion is necessary to ensure the proper discharge of its functions under the Act.

Members of
the Council

5. (1) Subject to section 7 (3), the Council shall consist of not more than thirty members who

shall be appointed by the Minister by instrument in writing from amongst persons appearing to him to be qualified and experienced in matters relating to science, technology, industry, finance or administration, or having such other qualification or experience which the Minister considers to be relevant to the development of Guyana.

- (2) At least six members representing between them the various sciences and technology shall be appointed by the Minister after consultation with the University of Guyana.
- (3) A member, other than the Chairman, may at any time resign his office by instrument in writing addressed to the Chairman, who shall forthwith cause the same to be forwarded to the Minister and upon the date of the receipt by the Chairman of such instrument such member shall cease to be a member.
- (4) The Chairman may at any time resign his office by instrument in writing addressed to the Minister and such resignation shall take effect as from the date of the receipt of such instrument.
- (5) The Minister may terminate the appointment of a member who absents himself from three consecutive meetings of the Council without leave from the Council.
- (6) The names of the members of the Council as first constituted and every change in the membership thereof shall be published in the Gazette.

Affixing of the seal of the Council.

6. (1) The seal of the Council shall be kept in the custody of the Chairman or the Deputy Chairman or the Secretary-General or such other officer of the Council as the Council may approve, and may be affixed to instruments pursuant to a resolution of the Council and in the presence of the Chairman, or Deputy Chairman, and the Secretary-General.
- (2) The seal of the Council shall be authenticated by the signatures of the Chairman, or Deputy Chairman, and the Secretary-General, and shall be officially and judicially noticed.
- (3) All documents, other than those required by law to be under seal, made by, and all decisions of the Council may be signified under the hand of the Chairman, or Deputy Chairman, or the Secretary-General.

7. (1) The Council shall meet at such times as may be necessary or expedient for the transaction of business, and meetings of the Council shall be held at least twice in every year and at such place and times and on such days as the Council may determine.

Meeting of the Council and procedure.

- (2) The Chairman may at any time call a special meeting of the Council and shall call a special meeting within seven days of a requisition for that purpose addressed to him in writing by any four members.
 - (3) Ten members of the Council shall form a quorum for the transaction of business at a meeting.
 - (4) Minutes in proper form of each meeting shall be recorded and shall be confirmed by the Council at a subsequent meeting.
 - (5) Subject to the provisions of this Act, the Council shall have the power to regulate its own proceedings.
8. (1) The Council may appoint such committees as it may think fit to advise the Council in the exercise of any of its functions under this Act. Committees
- (2) Every committee appointed under this section shall consist of at least two members of the Council, of whom one shall be appointed to be chairman of the committee, and such other persons, whether members of the Council or not, as the Council may think fit.
9. Subject to the provisions of this Act, the Council may delegate to any member or committee or officer of the Council the power and authority to carry out on its behalf such functions as the Council may determine. Power to delegate functions.
10. The Council may appoint and employ at such remuneration and on such terms and conditions as it thinks fit, a Secretary-General (who shall be the Chief Executive Officer of the Council) and such other officers, other employees and agents as it thinks necessary for the proper carrying out of its functions under this Act.
- Provided that:-
- a) no salary in excess of seven thousand two hundred dollars per annum shall be assigned to any office without the prior approval of the Minister;
 - b) no appointment shall be made to any office to which a salary in excess of seven thousand two hundred dollars per annum is assigned without the prior approval of the Minister.

11. (1) No action, suit, prosecution or other proceedings shall be brought or instituted personally against any member in respect of any act done bona fide in pursuance of the execution or intended execution of this Act. Protection of members.
- (2) Where any member is exempt from liability by reason only of the provisions of this section the Council shall be liable to the extent that it would be if such member were an officer or other employee, or agent, of the Council.
- Remuneration 12. There shall be paid to the Chairman and other members such remuneration (if any) (whether by way of salaries or travelling or other allowances) as the Minister may determine. of members.
- Funds and 13. (1) The funds and resources of the Council shall consist of:-
resources of the Council.
- a) such sums as may be provided by Parliament; and
 - b) all other sums or property which may in any manner become payable to or vested in the Council for the general purposes of the Council or in respect of any matter incidental thereto.
- (2) The expenses of the Council (including any remuneration of the members, officers, other employees and agents thereof) shall be paid out of the funds and resources of the Council.
14. (1) The Council shall keep proper accounts and other records in respect of its operations and such accounts shall be audited annually by an auditor appointed by the Council with the approval of the Minister.
- (2) The members, the Secretary-General, officers and other employees of the Council shall grant to the auditor appointed to audit the accounts of the Council under this section, access to all books, documents, cash and securities of the Council and shall give to him on request all such information as may be within their knowledge in relation to the functioning of the Council.

- (3) Any person who fails or refuses or neglects to comply with any request made by the auditor under this section or otherwise obstructs him in the performance of the functions conferred upon him by this section shall be liable on summary conviction to a fine of fifty dollars, in default of payment, to imprisonment for one month.

Report and 15. accounts to be submitted to the Minister.

- (1) The Council shall not later than the 30th June in each year prepare and submit to the Minister a report on its activities during the last preceding calendar year, including a statement of its accounts audited in accordance with the provisions of section 14.
- (2) The Minister shall cause a copy of the report together with the audited statement of accounts and the report of the auditor thereon to be laid before the National Assembly.
- (3) The Council shall submit to the Minister for approval not later than 30th September in each year, its estimates of revenue and expenditure for the next ensuing calendar year and shall during the last-mentioned year submit to the Minister for his approval any estimates of further expenditure as may become necessary.
16. (1) All discoveries and inventions made by the Council or by any of its officers or other employees or agents in the performance of its functions under this Act, shall be vested in the Council and the Council may make any such discovery or invention available to the public on such conditions and subject to the payment of such fees or royalties as the Council may think fit.
- (2) The Council may, with the approval of the Minister:-
- a) pay such bonuses or royalties as it may think fit to any person who makes any discovery or invention in the course of any research undertaken by or carried out under the direction of the Council, whether such person is a member, officer or other employee of the Council or not;

- b) where any discovery or invention is made available to the public subject to the payment of fees or royalties, exempt any person from the requirement to pay such fees or royalties or any portion thereof.
17. The Minister may, after consultation with the Chairman, give to the Council directions of a general character as to the policy to be followed by the Council in the performance of its functions and the Council shall give effect to any such directions. Policy directions
18. The Council shall be exempt from the payment of customs duty, capital gains tax, corporation tax, income tax, property tax, and purchase tax. exemption of tax.
19. Any person who:-
- a) being a member, officer or other employee or agent of the Council without the authority of the Council publishes or communicates to any person otherwise than in the course of his duties as a member, officer, or other employee or agent of the Council, any information acquired by him in the course of such duties; or
- b) being in possession of any information which to his knowledge has been disclosed in contravention of this Act, publishes or communicates such information to any person. Offences
- shall be liable on summary conviction to a fine of one thousand dollars and to imprisonment for a term of two years.
20. The Minister may, after consultation with the Council, make regulations for the carrying out of the provisions of this Act.

Passed by the National Assembly on the 7th August 1974.

F.A. Harain
Clerk of the National Assembly

APPENDIX B

GUYANA RICE BOARD

NOTICE

RICE MARKETING ACT (CHAPTER 72:01)

In pursuance of Section 17 (1) of the Rice Marketing Act (Chapter 72:01), the Guyana Rice Board hereby gives notice that the Board has, with the approval of the Chief Agricultural Officer (ag), fixed grades of rice effective as from March 1, 1976 as follows:-

SPECIFICATIONS FOR WHITE AND PARBOILED RICE TO BE PURCHASED

BY THE GUYANA RICE BOARD

A - Minimum Specifications for Different Grades of Parboiled Rice

GRADE	FACTORS						Remarks
	Red Rice %	Damaged Grains %	Discoloured Grains %	Broken %	Whole Grains %	Colour	
Extra Super	0.5	0.0	0.0	8.0	91.5	light	red rice should contain red-streaked grains only
Super	1.0	0.5	1.0	12.0	85.5	strew)	
Extra No.1.	2.0	1.0	2.0	20.0	75.0	strew)	
No.1.	3.0	2.5	3.5	25.0	66.0	dark)	Appearance of head
Extra No.2.	4.0	3.5	5.0	30.0	57.5	strew)	rice must conform to the guide samples
No. 2.	5.0	4.5	10.0	35.0	45.5	dark)	
No. 3.	6.0	10.0	10.0	45.0	29.0	strew)	
Super Broken	5.0	1.0	2.0	45.0		light	Broken should not contain more than 25 chips capable of passing through a 5 1/4/64 screen
Broken	20.0	10.0	10.0	over 45.0			Should not contain more than 25 Chips capable of passing through a 5 1/4/64 screen

Parboiled rice inferior to 'No.3 and Broken' will not be purchased except by negotiation as to price between farmer and the Management of the Guyana Rice Board

**B - MINIMUM SPECIFICATIONS FOR APPROVED VARIETIES (viz STARBONNET
BLUEBELLE AND "N" VARIETIES)**

**(i) Specifications for White Rice Processed from the varieties -
Starbonnet and Bluebelle**

Grade	F A C T O R S						
	Purity	Red Rice	Damaged Grains	Discoloured Grains	Chalky Grains	Clear Broken	Clear Whole grains
	%	%	%	%	%	%	%
Extra White A	90	0.5	0.0	0.0	7.0	14	78.5
White A	90	1.0	0.2	0.2	10.0	20	68.6
White B	80	1.5	0.5	1.0	20.0	25	52.0
White C	60	5.0	3.0	5.0	25.0	45	17.0
White Broken A		1.5	0.5	1.0			
White Broken B		5.0	3.0	3.0			
White Rice of an inferior quality to White 'C' will not purchased except by negotiation as to price between the farmer and the Management of the Guyana Rice Board							

(ii) Specifications for White Rice processed from the Variety 'N'

Grade	F A C T O R S						
	Purity	Red Rice	Damaged Grains	Discoloured Grains	Chalky Grains	Clear Broken	Clear Whole Grains
	%	%	%	%	%	%	%
Extra White A	90	0.5	0.0	0.0	7.0	14	78.5
White A	90	1.0	0.2	0.2	10.0	20	68.6
White B	90	1.5	0.5	1.0	20.0	25	52.0
White C	90	5.0	3.0	5.0	25.0	45	17.0
White A Broken		1.5	0.5	1.0			
White B Broken		5.0	3.0	3.0			
White rice of an inferior quality to White 'C' will not be purchased except by negotiation as to price between the farmer and the Management of the Guyana Rice Board							

Note: Only the above approved varieties viz Starbonnet, Bluebelle and N should be milled into White Rice.

BY ORDER OF THE
GUYANA RICE BOARD

March 31, 1976.

Neville E. Sutherland
General Manager

APPENDIX C
NATIONAL SCIENCE RESEARCH COUNCIL ANNUAL REPORT, 1975

BUREAU OF STANDARDS COUNCIL

This Council has from its inception, constantly and energetically pursued its objective of establishing a Bureau of Standards in Guyana. The Chairman has been especially diligent in insisting that consumers should get their money's worth of whatever they buy, and perhaps her enthusiasm in this regard has been communicated to the members of her Council.

Other factors which have stimulated the activities of this Council are its close collaboration with those CARICOM Countries which already have their own Standards Bodies and the need for harmonization of the policies of these bodies in the context of the growing regional integration movement.

Early in 1975, Council took steps to secure the appointment of a Director, Bureau of Standards. At the same time, Council invited Dr. J.A. Campbell, Deputy Director, Caribbean Food and Nutrition Institute (CFNI), to advise on the organisation and functions of a Bureau of Standards. Dr. Campbell submitted a report of his visit together with some recommendations. The report was circulated to members of the business community and other interested sectors for comment.

In September, Council sponsored a Seminar on Standards and Quality Control at the Guyana Teachers' Association which aimed at:-

- (i) Alerting all sections of the community as to the scope, significance and value of a Bureau of Standards in Guyana;
- (ii) establishing guidelines for a functional Bureau of Standards;
- (iii) initiating discussions and advising on procedures pertaining to quality control for the benefit of manufacturers; and

Key Objectives

These were defined as objectives which would provide large returns for any given investment of resources. These objectives are:-

- (1) To advise on the establishment of a functional Bureau of Standards with a Director not later than June 1976;
- (2) to ensure that there was an objective oriented system of standards operating in each of the major export industries, e.g., sugar, bauxite, rice, timber and shrimp;
- (3) to ensure that there was an objective oriented system of setting standards for all major items purchased directly by the External Trade Bureau;
- (4) to ensure that the draft of the Food and Drugs regulations was prepared by March 1976 and enacted by September 1976;
- (5) to demonstrate in a manner visible to the consuming public and others, the effective work of the Bureau of Standards Council by ensuring that locally produced commodities were manufactured to standards acceptable to the consumer;

Appendix C continued

- (6) to ensure that suitable and necessary building codes be published for the building industry;
- (7) to ensure the enactment of legislation dealing with consumer protection with special emphasis on labelling by June 1977;
- (8) to keep abreast of the trend towards metrication in More Developing Countries (MDCs) in the CARICOM area.

Extensive discussions took place towards the end of the year on:-

- (i) The appointment of a Director, Bureau of Standards and supporting staff. Firm recommendations were submitted to the NSRC;
- (ii) the establishment of objective oriented systems of quality control in the main export industries;
- (iii) the holding of a Workshop on Production of some consumer items especially tomato ketchup, peanut butter, jams and jellies;
- (iv) the setting up of a select committee on building codes;
- (v) metrication;

Appendix C continued

- (vi) Food and Drugs regulations;
- (vii) reviewing generally the draft Food and Drugs Regulations of Guyana.

Immediately after the Seminar, the post of Director, Bureau of Standards was advertised and with the appointment pending, Council moved to establish guidelines for the functioning of the Bureau. A select committee was established and discussions were initiated with representatives of five major organisations in Guyana which contributed significantly to the country's foreign exchange earnings. The discussions centered on facilities within the respective establishments for the determination of standards. Council records with satisfaction and gratitude the forthright cooperation shown by these concerns. As a result of these discussions the following functions and objectives of the Bureau of Standards Council were defined:-

Functions

- 1) To promote the formulation of standards in these areas:-
 - (i) for national development;
 - (ii) for the regulation of trade;
 - (iii) for the protection of the consumer.
- 2) To promote research in relation to the development of standards;
- 3) to collect and disseminate information on standards for the use of Government Ministries and the private sector;
- 4) to encourage the training and recruitment of personnel in Standards and Quality Control, and to advise on suitable conditions of service.

Appendix D

QUALITY CONTROL SURVEY AND QUESTIONNAIRE FORMS

AN OBJECTIVE-ORIENTED SYSTEM OF STANDARDS AND QUALITY CONTROL (*)

The Bureau of Standards Council of the National Science Research Council has as one of its objectives the ensuring that there are objective-oriented systems of standards and quality control operating in each of the major export industries viz., Sugar, Bauxite, Rice, Timber, and Shrimp.

You have attended a Meeting of the Sub-Committee dealing with the above. You are now asked to reply to the attached Questionnaire which would attempt to determine the level at which such systems are operational in your industry.

We expect that the principles of some of the systems used in one industry would be applicable in another and we expect to point out areas of action in standards and quality control in your industry.

You are asked to return the completed Questionnaire by 15th March 1976. Any questions relating to the Questionnaire would be gladly handled by Dr. L. Chin, the Chairman of the Sub-Committee (Phone 63281 ext. 21).

(*) Reproduced in this Report by permission.

SYSTEM OF STANDARDS AND QUALITY CONTROLOPERATIONAL IN THE INDUSTRY

1.1 WHO sets the quality standards in your organization?

1.2 What is his/her position in the organization?

Show this position on an organization chart with the relationship with production personnel.

2.1 WHO makes the day-to-day quality control decisions in the various sections of the organization? (In particular, who carries the responsibility for checking that the final product conforms to specifications as set by the organization?)

2.2 What are their positions in the organization?

Show their positions on an organization chart.

3.1 Briefly describe the system used in determination of the SPECIFICATIONS of each of your products. (If possible, attach actual grades and specification).

3.2 Are the grades and/or specifications:

1	2	3	Product No	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	international	1=
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	of the specific	
			importing countries	2=
			namely.....	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	specific to Guyana	3=

3.3 Are the specifications reviewed regularly to determine whether they are optimum?

If so, what is the review procedure and how often is it carried out?

3.4 What is the procedure used in checking each final product against specification?

3.5 What controls, if any, are employed in 3.4 above to ensure that the procedures themselves are performing according to expectations?

3.6 Is there a laid-down procedure for taking action if a sample of final product does not conform to its specification? If so, what is the procedure?

4. The systems used for controlling the QUALITY OF MATERIALS used in production.

4.1 Who sets the specifications of

(a) raw materials?

(b) for other materials used in direct production?

4.4 Is there a laid down procedure for taking action if a sample of raw materials or other production materials does not conform to specifications? If so, what is the procedure?

5. The systems of measurement of QUANTITIES of final product as sold.

5.1 Describe such systems. Are these systems evaluated or calibrated regularly? If so, how often?

5.2 Describe the system of evaluation.

5.3 What are the tolerances for measurement of quantities of final product as sold?

(a) The minimum acceptable by the customer.

(b) The maximum as set by policy.

(c) The maximum as occurs in practice.

5.4 Is there a laid-down procedure for taking action if there are significant deviations found after each evaluation (or calibration) of the systems used in measurement of quantities of final product?

6. CONSUMER ORIENTATION

Some of the major industries also sell their products on the local market. (This section does not apply to the Bauxite industry).

6.1 Attach if possible the specifications of the products as sold on the local market.

APPENDIX E

SYSTEM OF STANDARDS & QUALITY CONTROL

OPERATIONAL IN THE SUGAR INDUSTRY

1.1. The products of the sugar industry are:

- | | | |
|-------------------------|---|--------------------|
| (a) Raw Sugar (DC) | - | Local Sales |
| | - | U.K. Market |
| | - | U.S. Market |
| | - | Caricom Market |
| | - | World Market |
| (b) Yellow Crystal (YC) | - | U.K. Market |
| (c) Dark Molasses (DM) | - | U.K. Market |
| (d) Low Grade (LG) | - | U.K. Market |
| (e) White Crystal (WS) | - | Local Sales |
| (f) High Test (HTC) | - | Local Sales |
| (g) Final Molasses | - | Export |
| (h) Final Molasses | - | Local Distilleries |
| (i) Final Molasses | - | Other small users |

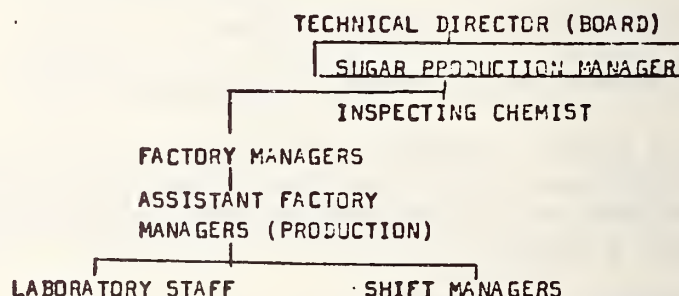
Quality standards for 1.1 (a) Local Sales
(e) Local Sales

are set by Law. (Laws of Guyana 1953 Volume 111, Chapter 144 "Sale of Food and Drugs, page 130).

Quality standards for all others, except 1.1 (e) are set by the buyers of the commodities.

However, the Sugar Production Manager of the Corporation is responsible for ensuring that factories' personnel are fully aware of the quality standards required in their respective products.

1.2.



2.1. Assistant Factory Managers (Production), being located at the actual production sites, make the day-to-day quality control decisions.

2.2. See above chart.

Appendix E continued

3.1. Quality Specifications:

<u>Market</u>	<u>Grade</u>	<u>Parameters measured</u>
Local	DC	° pol, % moisture
	WS	° pol, % moisture
	HTC	° pol, % moisture
U.K.	DC	° pol, % moisture
	YC	° pol, % moisture, Reflectance
	DM	° pol, % moisture, Lovibond tint
	LG	° pol, % moisture
U.S.	DC	° pol, % moisture, Colour,
		Filterability, Grain Size, % Sulphated Ash. % R.S.
Caricom	DC	° pol, % moisture
World	DC	° pol, % moisture
Export	Final Molasses	Brix, Pol Sucrose Purity
Local Distilleries	Final Molasses	Brix, Pol Sucrose Purity

Brief description of analytical methods used:

Opol: Optical method using normal weight in 100 ml., clarification with wet lead and testing in 200 mm. tube.

% moisture: Oven-drying at 100.- 105 °C to constant weight.

Reflectance: Using EEL reflectance meter.

Lovibond Tint: Preparation of a 5% sugar solution, clarifying with Kieselguhr and reading in a $\frac{1}{2}$ " fused glass cell in a Lovibond Tintometer, using Series 52 slices.

Colour: Preparation of a standard solution of affinated sugar clarifying with diatomaceous earth, adjusting pH and reading in a Hilger (or similar) Spectrophotometer at 560 mμ, choosing cell length so that instrument reading is between 20 and 60% transmittancy.

Filterability: Preparation of a standard solution of affinated sugar, and measuring volume of solution passing through a specially-calibrated filter membrane in 10 min. at 22" vacuum.

Grain size: Wash-treatment of affinated sugar with methanol and ether followed by air-drying, then a standardised sieving procedure through Tyler 14, 20 and 28 screens, for 5 minutes, with collection and weighing of fraction passing through the Tyler 20.

§ Sulphated Ash: Treatment of sugar with Conc. Sulphuric acid, carbonising over flame, followed by ashing in a Muffle furnace at 550°C; second Sulphuric acid, ashing and Muffling, then cooling and weighing of residue.

§ R.S: Preparation of a standard sugar solution, and titration with Fehling's solutions, using Lane and Eynon's apparatus.

Brix, Pol Sucrose and Purity: Standard methods.

3.2. Table given in 3.1.

3.3. No.

3.4 At production sites: Sampling and analysis on

- (a) each batch of product
- (b) each production day (at time of bagging for Local Sales)
- (c) each shipment day i.e. bulk lorries for a 24 hour period.

At Central Laboratory/Sugar Terminals/Shipping Point:

Sampling and analysis on:

- (a) Bulk shipments as received
- (b) Bulk cargoes, as loaded on to freighters.
- (c) Bagged sugar cargoes, as loaded on to freighters.

3.5. Cross-checking of;

- (a) Sampling procedures
- (b) Duplicate and triplicate analysis
- (c) Comparison with outturn results
- (d) Storage of samples

3.6. The procedure varies with the product:

- (a) Bulk Cargoes - These are usually allowed to proceed, since a sub-standard parameter will attract a price penalty. Segregation and re-treatment of bulk cargoes are generally not practicable.
- (b) Bagged Sugar for Local Sales: .Can be returned to producing Estate for reprocessing.
- (c) Bagged Export Sugar Can be returned to producing Estate for reprocessing or downgrading e.g. Y.C. to D.C - Such decisions are usually documented.

4. Materials used in producing sugar are:

- (a) Cane
- (b) Water
- (c) Lime
- (d) Triple Superphosphate
- (e) Special Chemicals

Appendix E continued

- (a) Cane: There are usually no objective standards set for Cane as a raw-material, although ^o pol, % fibre, and % extraneous matter can be measured.
- (b) Water: None.
- (c) Lime: Usually none, although a measurement of extraneous stone content is possible.
- (d) Triple Superphosphate: None.
- (e) Special Chemicals: None.
- 4.1. (a) For Cane, the Estate Field Managers will try to ensure that the "best" Cane is supplied to the Factory, using the means of assessment at his disposal. For purchased raw materials, the specifications are generally standard. The raw material "water" could easily be monitored by the Factory Management.
- (b) -
- 4.2. Not usually.
- 4.3. For Cane, while a description i.e. pol and % fibre is obtained at the Factory, this is not for comparison with any set specification, but purely for Factory control. Other raw materials are physically assessed as a routine management procedure.
- 4.4. For purchased raw materials i.e. Lime, Triple Superphosphate and Special Chemicals, the Purchasing agents of the Corporation will be informed, and they will take the matter up with the Suppliers.
5. For Sugar: Bulk: Batch weighing on Dennison Road/Railway scales.
Continuous weighing on Servo-Balans scales.
Bagged: Sack-fillers, and periodic check-weighing of filled sacks.
- For Molasses: Volume: Tank calibration
Weight: Pneumators, Servo-Balans scales.
- 5.1. Scale-checkweighing procedures:
As convenient, for Road/Railway scales
Daily, for Servo-Balans scales.
During actual operations, for Bagged sugar.
- 5.2. For Road/Railway scales, using known test weights.
For Servo-Balans, using built-in testing mechanism.
For sack-fillers, using accurate platform scales, and known test weights.
- 5.3. (a) Bulk sugar customers usually weigh the cargoes on receipt, and this weight forms the basis for payment.
Bagged sugar buyers will probably accept $\pm .5\%$.

Appendix E continued

(b) Policy: Should depend on the built-in accuracy of the weighing machines themselves, although in bulk-handling operations, losses at transit points are inevitable.

(c) Variable (see 'b')

5.4. Re-calibration of weighing machines; occasionally a compensation for the customer in some form may be necessary.

6.1. For products sold on Local Market

O in C 19 (a) Where refined, granulated or White Crystal sugar contains not less than 98.5 per centum of sucrose by polarisation.

O in C (c) Where Dark Crystals or refinery crystals contain not less than 94 per centum of sucrose by polarisation and not more than a total of two and a half per centum of mineral and organic matters other than sugar.

GUYANA SUGAR CORPORATION LIMITED,
Factory Operations Department,
JMR:cc - 28th May, 1976.

IX REFERENCES

Reference to a great deal of literature related to standardization and related activities, most of it brought to Guyana and deposited with the NSRC by the NBS team, is made in various parts of the report. This is particularly evident in section III parts 4.0 and 5.0. These will not be repeated here.

A number of references generally not listed elsewhere in the report served as background and related information. These are as follows:

1. Area Handbook for Guyana, DA Pam 550-82, November, 1969, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.
2. Background notes, Guyana, Department of State, April 1974.
3. Foreign Economic Trends and Their Implications for the United States, Guyana, FET 75-116, October 1975, American Embassy, Georgetown.
4. Burnham, Forbes, A Destiny to Mould, Africana Publishing Corporation, New York, 1970.
5. Guyana Handbook 1976, Guyana Manufacturers' Association Ltd., Georgetown.
6. Campbell, J.A., Report on the Development and Enforcement of Standards in Guyana to NSRC, CFNI-J-26-75, Caribbean Food and Nutrition Institute, Kingston, Jamaica, April 1975.
7. Report of the Meeting on Harmonization of Regional Standards, Jamaica Bureau of Standards, 25-26 September, 1974.
8. The Establishment of A Caribbean Common Market Standards Council, Inaugural Meeting of the Caribbean Common Market Standards Council, Georgetown, Guyana, 20-21 May 1976, CMSC 76/1/2, 10 May 1976 and 76/1/3, 17 May 1976.
9. Lome' Dossier, The Courier, European Community - African - Caribbean - Pacific, No. 31 - Special Issue, March 1975.
10. The Role of Standardization in Economic Development, Proceedings of an ISO Conference, September 1973, Mexico City.

11. National Science Research Council, Annual Report, 1975.
12. A Manual for the Operation of an Information/Public Relations Department in a Standards Organization, by Rohn Hopper, Thai Industrial Standards Institute/UNDP-UNIDO Project, Bangkok, Thailand, 1974-12-24.
13. Verman, Lal C., "Standardization - A New Discipline", Archon Book, 1973.

X TEAM RESUMÉS

For background information resumés for the NBS team members are presented here.

NIELS C. BECK - RESUMÉ

1. USAID Industry Division - USAID/Vietnam November 1967 to April 1975:

Received Ministry of Economy's Economic Medal (1972) for rehabilitation of war damaged industrial plants (Tet 1968).

Advisor for the government of the Republic of Vietnam to the national Standards Institute (NSI). Wrote the original survey including staffing pattern, literature, and equipment requirements while on leave from USAID/Korea in April, 1967, based essentially on observed requirements in small scale industries' manufacture and measurement services, e.g., forest products, handcrafts, leather, rubber, soap, "artisan" sugar, salt, ceramics; building, road, and waterway materials; imported component assemblies (bicycles, motor bikes, electrical appliances); food, feed, pesticide, and fertilizer testing, and related industrial safety standards.

Pursued the recommendations of this original survey for 7 1/2 years to some significant successes in industrial support as measured in domestic and export product volume and quality.

South Vietnam's extensive canal system (Delta and Ca Mau Peninsula) and hot, humid climate required early development of NSI awareness of the need for applicable technical information services on the movement and protection of commodities and maintenance of related infrastructure.

2. Industry Division, USAID/Korea 1962-67

Industry Advisor for ROKG to National Industrial Testing Lab. in Seoul, 1962-67. Similar to NSI (above), but oriented to small ferrous and non-ferrous metal foundries, die casting, metal stampings, electrical product and assembly shops, machine shops and, especially, related promotion of industrial safety standards - 5 1/2 years.

Also, for USAID, for other labs in Korea, industrial promotion and techno-economic counseling; specifically, on exports, in-plant trouble

shooting, production and quality control, industrial lab development, inspection, testing and standardization.

Industry Advisor for USAID to Korean Institute for Science and Technology (KIST) 1965-69. Promotion of an industrial/scientific community through KIST.

Member - industrial project loan committees for Korean Reconstruction Bank and Medium Industry Bank, 1964-69.

Received - ROK Prime Minister's Citation 1967 for assistance in export promotion. The Prime Minister's Citation was awarded to two Americans, Mr. Amicus Most and Niels C. Beck for their successful joint effort in the ROK export development program.

3. Armour Research Foundation (now Illinois Institute of Technology Research Institute) 1953-62.

Program Development Manager 1953-56

Planning R&D services needed by and attractive to U.S. private industry, e.g., corrosion preventives, new engineering materials (fiber metals), industrial plant controls; rehabilitation program for Eastern Kentucky (making do with local, low-cost labor and limited natural resources); advisory services to Merrill, Lynch, Pierce, et al., in techno-economic investment analysis.

Director, Union of Burma Applied Research Institute 1956-60

To build, staff, and equip a national testing and R&D lab in Rangoon, Burma. Development of methods for upgrading rice by-products (rice bran and rice bran oil), shrimp oil and other fish products, bamboo pulp (especially hard board), ceramic products, foundries, mineral beneficiation and related testing and industrial safety standards - four years.

On way home from Burma, completed industrial survey (30 days) for Asia Foundation in Kabul, Afghanistan, which resulted in Armour contract to build, staff, and equip a small industrial testing laboratory attached to the University of Kabul - later expanded as a very useful national facility for testing minerals, ceramic products, building and road materials, fibers, textiles, food and feed products.

Assistant Director ARF 1960-62

Promotion and development of contracts for R&D services to private sector and U.S. Government and military.

4. Parks College of St. Louis University

Dates employed: 1939-53

Teacher: Mathematics and Economics 1939-45

Department Head: 1943-45

Dean of the College - 1945-53

Men's boarding college offering B.S. in aerospace engineering (graduates were project leaders for major aerospace projects: Mercury, Gemini, et al.); R&D services to McDonnell Aircraft Corporation (now McDonnell Douglas Corporation).

5. Academic Record

B.S. (Chemistry) and A.B. 1934, Regis College, Denver, Colorado. Working on doctoral dissertation in Geophysics, St. Louis University, St. Louis, Missouri, when appointment as dean (1945) precluded further graduate work.

6. Professional Activities

Sigma Xi, Society of Automotive Engineers, Am. Geophysical Union, AAAS, Am. Society for Engineering Education, former Assoc. Editor Industrial Research Magazine; Who's Who in America, American Men of Science, former member Mayor's Council on Hyman Relations (St. Louis), Burma/America Society, Korea/America Society, Vietnam/America Society, Life Member Burma/Science Society; former member professional Employees Relations Committee, McDonnell Aircraft Corporation; former consultant to Braniff Airways Technical Committee; Chairman, Chicago YMCA Inventors' Club, Ambassador's Service Medal/Vietnam.

H. STEFFEN PEISER - BIOGRAPHICAL SKETCH

A U.S. citizen by naturalization, was born on August 19, 1917, near Berlin, Germany. His father was Swiss. Peiser spent much of his life in England where he attended St. John's College Cambridge University, 1936-1941, obtaining his "honours" B.A. in 1939 and the M.A. in 1943, having taken the Natural Sciences Tripos parts I and II with Chemistry, Physics, Mineralogy, and (advanced) Mathematics. In 1939, he was awarded a Hutchinson Research Studentship at Cambridge University and worked in crystal chemistry under Professor Sir W. Lawrence Bragg. In 1965-1966 he was Visiting Professor at Harvard University, Cambridge, Mass.

From 1941-1947, Peiser worked on several wartime scientific assignments including an attachment to Dr. C. W. Bunn's laboratory at ICI, Winnington, working on the structure of polyethylene and texture of nylon and polyesters, and to the Atomic Energy Research Establishment, Harwell, under Professor Sir Francis Simon, working on the structures of high temperature forms of uranium and its carbides and oxides. After a brief period, 1947-1948, as senior lecturer at Birkbeck College, London University, under Professor J. D. Bernal, and as deputy director of the Nuffield Cement Research Laboratory, Peiser joined the research staff of Hadfields Ltd. as head of metal physics research and (later) also as principal scientist of the government supervised Aeronautical Inspection Directorate's Test House. In April 1957, he joined the U.S. National Bureau of Standards, originally as guest scientist under the free-radicals research program, and later as staff member and Chief of the Mass and Scales Section, 1958-1961. Peiser became Chief of the Crystal Chemistry Section, 1962-1968. During part of that time, he was coordinator for all crystal growth research at NBS. He became Chief of the NBS Office of International Relations and, in addition, in 1970, Manager of the NBS Special Foreign Currency Program. He has been a U.S. delegate to several international meetings.

His research interests and scientific-society associations are too numerous to list comprehensively in a brief biographical sketch. Basically, Peiser is an x-ray crystallographer interested in aspects of precise measurement and characterization of pure crystals. He is editor of several major publications on x-ray crystallography, crystal growth and technical development of less industrialized regions. He is author of many original papers especially in crystal symmetry theory. Peiser is a member of Sigma Xi, the American Crystallographic Association, and the American Chemical and Physical Societies. For six years he was Secretary of the Commission on Atomic Weights of the International Union of Pure and Applied Chemistry. He has traveled extensively and has led diverse technical missions especially to the following countries: Bolivia, Ecuador, Japan, Korea, the Philippines, and Thailand. From 1963-1968, he served as Secretary of the Panel for Exchange of Information and Materials of the U.S./Japan Program for Scientific Cooperation.

KENNETH S. STEPHENS - RESUME

Dr. Kenneth S. Stephens is a lecturer in the School of Industrial and Systems Engineering and Research Consultant to the Engineering Experiment Station of Georgia Institute of Technology. He holds a B.S. in Mechanical Science from LeTourneau Technical Institute and MS and Ph.D. degrees in Applied and Mathematical Statistics from Rutgers

- The State University of New Jersey. He is a registered professional engineer in Pennsylvania and Texas.

Earlier international projects include (1) International Rice Research Institute (IRRI) - Thailand cooperative project on industrial extension program for small scale farm machinery, Thailand and Philippines, (2) Technical assistance to Soong Jun University and small scale industry, Employment Generation Through Stimulation of Small Scale Industry Project, Korea, (3) US NBS/AID Survey on Standardization and Measurement Services, Philippines, (4) SISIR/NBS/AID and SISIR/UNIDO seminars on testing and certification of export products, and workshop on quality control and certification marking for industrial products, Singapore, (5) UNIDO project with the Thai Industrial Standards Institute on standardization, certification and quality control, Thailand, (6) Statistical quality control seminars in Mexico City and Guadalajara, Mexico and (7) Member of United Nations technical assistance team on statistical quality control, India.

For twelve years, Dr. Stephens served with the Western Electric Company at locations in Allentown, Pennsylvania, and Princeton, New Jersey as quality engineer, chief of quality control, and reliability engineering on electronic components, chief of engineering personnel and staff and research leader, applied mathematics and statistics research and consultation. Additional industrial experience includes consultation with Texas Eastman Co., R. G. Le Tourneau Inc., Thiokol Chemical Co., Monroe Calculator Co. and Coca Cola Co.

Academic experience covers over nine years at Rutgers University, Le Tourneau College and Georgia Institute of Technology. He has taught special courses in industrial engineering, computer science and statistics for Texas A & M University, Chulalongkorn University (Bangkok) and the Asian Institute of Technology (Thailand).

Dr. Stephens holds membership in Sigma Xi and in quality control and statistical societies in the U.S. and abroad. He has made more than fifty presentations at conferences and seminars in the U.S. and abroad and has published over 30 significant papers and reports on related topics. He has conducted original research on acceptance sampling methodology.

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